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TRANSACTIONS

OF THE

LITERARY AND HISTORICAL SOCIETY

OF

QUEBEC.

FOUNDED, JANUARY 6, 1824.

VOLUME III.

QUEBEC:

PRINTED FOR THE LITERARY AND HISTORICAL SOCIETY.

BY W. NEILSON,

No. 14, Mountain Street.

PREFACE.

In giving to the public this third volume of the Transactions of "The Literary and Historical Society of Quebec," a very few words only are necessary to be said respecting the subjects of which it treats. Like the preceding volumes, it is chiefly confined to details of the Natural History of the country, and a few subjects of general literature: but the Society has not overlooked the principal object for which it was established, and from which it derives its name. A manuscript containing interesting details of the history of the province, between the years 1749 and 1760, has been committed to the press, and will speedily appear in a separate volume.

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TRANSACTIONS.

ART. I.—ON THE TEMPERATURE, FOGS AND *MIRAGES* OF THE RIVER ST. LAWRENCE. BY WILLIAM KELLY, M. D. SURGEON, R. N.

READ BEFORE THE SOCIETY ON THE 4TH FEBRUARY, 1832.

THE naval surveying party employed on the St. Lawrence, under the command of Captain Bayfield, leaves Quebec every year towards the end of May; and returns at the close of the month of October. The intervening time is passed in different parts of the river and gulf. During the progress of the survey in the years 1829, 30 and 31, frequent opportunities occurred for making the observations, now submitted to the Society.

The temperature of the waters of the St. Lawrence differs very much, as might be expected, in the different seasons. But as the changes of temperature in the water are gradual and slow, whilst those of the air, both at the approach of summer and winter, are very sudden and considerable, certain atmospheric phenomena result, the endeavour to account for which is the chief object of the present paper.

On collecting the observations, however, respecting the temperature of the surface water, it appears that it does not uniformly follow the changes of the seasons; but is

much influenced by certain localities, and by the strength and direction of the winds. Where free from these disturbing causes, the water acquires its maximum temperature about the beginning of September. The mean maximum temperature of the air is in July.

Above the Richelieu, the river, little influenced by the tides, warms or cools as the seasons change. It sinks to 32° when the river is frozen over in the winter, and rises to 62° by the beginning of September. The temperature of 62° I found constant both at the surface and in the deep water all the way from Crane Island to Lake St. Peter, whilst making a passage up the river in September, 1831; and from Quebec upwards in 1830, though the average temperature of the air, at the time, was only 56°.

In the tide waters above Red Island, especially in the south channel where the depth is much less, and there is a much greater proportion of fresh water than in the north, the temperature at the surface increases with tolerable regularity during the summer, though suffering a temporary reduction from time to time in consequence of easterly gales. As we generally anchored on the south side during the two last summers, I have not had an opportunity of ascertaining the temperature of the waters in the north channel, but from the complaints made by the bathers at Malbaye of the coldness of the water, the influence of the summer's heat on it would seem to be much less than on the south shore.

But below Red Island, where the river expands into an æstuary, this influence is only perceptible in fine weather, and is even there confined to the surface. On the morning of the 8th July, 1831, after some days of warm clear weather and light winds, the surface water about half way between Matane and the north shore was 60°. A fresh breeze from

the westward came on in the evening, and continued all night; on the morning of the 9th the surface water had fallen to 39°. The temperature of the air at this time was between 64° and 62°. It fell nearly calm again towards mid-day, and the temperature of the surface rose to 57°, but again blowing with increased force during the night, on the 10th, at 9, A.M. it had fallen to 37°, and the air to 44°.

On the 8th, when the surface water was at 60°, water taken up by Dr. Woolaston's machine from a depth of thirty fathoms was 35°, from fifty fathoms 34°. During the calm on the 9th, off Point des Monts, the temperature of the water at different depths was found as follows. Surface water drawn up in a bucket (care being taken to prevent its being influenced by the temperature of the vessel,) 57°. The register thermometer sunk three feet indicated 44°, at ten fathoms 38°, water drawn from a depth of 100 fathoms 35°. The specific gravities of these waters also differed very much. On the 8th, the surface water was 1,0180; that from thirty fathoms 1,0260, that from fifty fathoms 1,0265. The water taken up from 100 fathoms on the following day, had a specific gravity of 1,0275.

Hence it appears, that in fine weather the warm fresh water of the river and tributary streams floats on the surface; but when the waters are agitated, it becomes mingled with the permanently cold waters beneath. The temperature of the surface water, therefore, depends more on the strength than the temperature of the winds. In the higher parts of the river their direction also has great influence; as the easterly gales, by causing a commotion in the deep waters all the way from the gulf, tend much more to cooling the surface, than the westerly, which only act on a comparatively small extent and depth; and besides on

parts where there is a much greater proportional admixture of fresh and warm water.

Besides these causes, more or less temporary, of difference of temperature on the surface, arising from the seasons and winds, there is another, which seems to operate constantly between Red Island and Bic inclusive. It may, perhaps, extend farther down on the south shore, and up on the north, but we have had as yet no opportunity of ascertaining it. We made repeated trials of the temperature of the surface water within this space, and never found it to reach 50°. It was usually from 38° to 45°. It was the same in June, July and September, and probably in August, though we had no opportunity of trying. Its specific gravity was also much greater than that of the surface water lower down in fine weather.

Between Red Island and Bic there is a constant set down, *much greater during the flood tide, in some parts*, than in the ebb. This latter circumstance, combined with its greater coldness and specific gravity, corresponding with the deep waters, would seem to indicate that the lower part of the great tidal wave, meeting with a sudden resistance, was forced to the surface, and at the same time compelled in part to take a retrogade course. A reference to a correct chart will shew that such resistance exists in consequence of the change in the form of the bottom at this place. The south bank, increasing in breadth from Matane to Bic, causes the mass of the tide water to flow along the north shore; whilst Bic, and Bicquette projecting across the course of the water that flows on the bank, it cannot arrive so speedily at the space above these Islands, as the principal tidal wave. But this wave is itself also checked, first, by Red Island and its extensive shoals; and again by the *com-*

paratively shoal bank, that extends from White Island to the south shore. The deep water meeting this resistance at Red Island, is consequently forced up, giving rise to the frightful eddies and whirls that surround it.* The interruption of its free course causes the water to attain a higher level at this place, and a part of it flows back past Basque and the Razades,and over the bank above Bic and Bicquette, where, as already mentioned, it must, from the obstruction caused by these islands, be slower in acquiring the general level of the mounting waters. Had the obstruction at Red Island not existed, it is probable that the tides above Bic would be the same as immediately to the eastward of it; that is, it would set on the bank, or towards the shore, at the first of the flood; and off the bank, or from the shore, at the beginning of the ebb, instead of flowing straight up and down, as it does in those parts where no banks or shoals exist.

The constant current down between Red Island and Bic, has been attributed to the flow of the fresh waters of the St. Lawrence and Saguenay; but how can this take place at the same moment that all the water above the former points, fresh and salt, is flowing rapidly upwards. Besides its increased rapidity during the flood tide, its coldness in all seasons, and above all, its specific gravity, are in direct contradiction to such an opinion.

The temperature of the deep water of the St. Lawrence

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* Are the fogs on the Banks of Newfoundland caused by the cold deep water flowing from the poles to the equator, being forced to the surface there in consequence of the interruption given by the Banks to its course to the southward? Humboldt found the surface water on the Great Bank 9° cent. lower than the surface of the neighbouring sea, and 12° cent. lower than the gulf stream, at no great distance.

has only been examined by us this year; but the extreme cold of the surface water in the space above mentioned, attracted our attention in July, 1829; and since that time we have found it the same, both in July and September, every year. At first we thought it might be owing to the presence of ice-bergs in the gulf; but being bound down at the time, and the weather being fine, we found the surface water, as we approached the gulph, become sensibly warmer, and no trace of ice-bergs there. We were afterwards disposed to attribute it to the waters of the Saguenay, which, entering here at an angle, seems to turn the stream of the St. Lawrence over to the southward during the ebb, and might be supposed, from its great depth, to form a reservoir of water remaining cold from the winter. But the facts since ascertained respecting the specific gravity of the surface water within this space, and the increased velocity with which it flows downwards during the flood tide, are irreconcilable with such an opinion. It is not difficult to understand why the deep waters of the St. Lawrence are cold at all seasons, when we recollect that there is a constant current through the Straits of Belle Isle into the gulf, which is probably a part of the great stream flowing from the pole to the equator; whilst the water of the river, from its inferior specific gravity, has a tendency to float on the surface, causing a constant current downwards along the south shore, as we approach the gulf, and not mingling generally with the salt water beneath, except when agitated by strong winds.

One of the most remarkable consequences of the coldness of the surface water, and the most important to those who navigate the river, is the fog, which, in fine weather with calms, or very light winds, often covers the surface of the

water. These fogs are sometimes so dense, that once at mid-day, whilst the sun was shining overhead, we could not see any part of a vessel, which passed so close to us that we could hear the people speaking to one another on board. They are not generally attended with rain; but the decks are often kept wet, and large drops fall upon the rigging, which seems to collect the condensed moisture of the atmosphere. Frequently by ascending some way up the rigging, we could look over the fog, and see the hills clear around us. Captain Bayfield remarked, that from a considerable height in the rigging, the view even towards the surface of the surrounding water was much more extensive than on deck.

On the 14th of June, 1831, between Red and Green Island, we passed through a fog that lay only on the water, the land being quite clear. The wind was moderate from the S. W. It had been blowing from the eastward for the three previous days. As we went along on a wind, a part of the surface to leeward and just astern of the vessel, was almost quite clear of fog. The clear part was in breadth little more than the length of our vessel; but its depth was considerable, and exactly in the direction of the wind. It preserved its relative situation just astern of the vessel as we passed down, and seemed to be owing to the vessel and sails preventing the breeze from coming in close contact with the water. Had we been stationary, it is probable the clear space would remain directly to leeward of us.

Whenever this fog occurred, the due point of the air ascertained by Daniell's hygrometer, was several degrees higher than the temperature of the surface water. If a fresh breeze sprang up, particularly from the westward, it was soon dispersed. It will easily be understood that

whilst air, with a high dew point, or, in other words, with much moisture, rested on the cold surface of the water; the latter, acting uninterruptedly on the same column, or stratum of air, would, by cooling it, cause much of its moisture to be precipitated; but if an equally moist wind blew briskly over it, no part of the air would be exposed to the cold from the water, for a length of time sufficient to cause a perceptible deposition. It was the great frequency of these fogs in the neighbourhood of Bic and Red Island, that first directed our attention to the temperature of the water at this place. Here they occurred with light airs, either easterly or westerly; but in other parts of the river, they were generally accompanied, or preceded by wind from the eastward. They occur in any part of the æstuary, when a calm follows quick on a fresh breeze in any direction, that agitates the waters, so as to bring the cold to the surface. Sometimes we observed such a fog lying on the waters of the north channel, whilst we were free from it in the south. This which may be distinguished as the fine weather fog is very different from that which usually accompanies an *easterly gale.* In the latter, the deposition seems independent of the temperature of the water, and appears to be caused by the mixture of currents of air differing in temperature and dryness. It extends into the upper regions of the atmosphere, cannot be overlooked from any part of the rigging of a ship, and is seldom so dense on the surface as to hide the view of objects within half a mile, or more, by day-light. It is generally accompanied by constant rain; and the sun is never seen to shine through it. It extends over land and water, the highest hills, as well as the low country.

A third species (if I may use the term) of fog, was noticed

at the head of Lake St. Peter, on the morning of the 30th September, 1831. It covered the river to a height of ten or twelve feet, and was hurried rapidly along by a strong wind from the westward. It continued from daylight until about 10, A. M. In this case, the circumstances were the reverse of what takes place in the Bic fogs, for the wind was very fresh, the temperature of the air 40°, its dew point 37°, the surface water 58°. Here the vapour, which was constantly escaping from the water, was instantly precipitated by the cold wind that passed rapidly over it. A simlar phenomenon, on a smaller scale, is observed in winter, when a fresh wind below zero blows over an open space in the river. Do these facts militate against the opinion, that the water in the atmosphere is held in solution by the air? Can we suppose that it dissolves and precipitates it at the same time?

Another effect of the changes caused in the air, by its con tact with the cold surface water, is the mirage which is seen occasionally, during the months of June and July, in every part of the river where the tide waters flow; and in the space between Bic and Red Island, at all seasons when we had occasion to visit it. It is always observed in fine weather, with a clear sky; and, like the fog first mentioned, generally in calms or light winds: but its presence seems compatible with a fresher breeze than I have ever known to accompany the fog. The remarks also respecting the direction of the winds, and the localities, apply equally in both cases. With this mirage, as with the fog, the temperature of the surface water has been invariably found lower than the dew point of the air; though the difference was generally much less in the former case, than in the latter. These circumstances seem to shew that both phenomena depend on the same

causes, varying only in degree. To this I may add, that I never saw the phenomena of the mirage to so great an extent, as occasionally at a moment when the fog was dispersing.

The first appearance generally noticed at the commencement of the mirage, is on the lower ridges of hills, or points of land that run into the water. Here a line of the trees with which all the hills are covered, seems raised much above the level of the rest, resembling precisely a straight lofty hedgerow; and the tops of all seem to attain the same level, however uneven the ridge may be on which they grow. The appearance of a hedgerow is soon lost, as all the trees attain the same apparent height; giving an appearance of an immense table, stretching from hill to hill. The shores in the meantime assume the appearance of a straight wall; and the islands seem girt with a similar enclosure, or bounded with precipices all round. Their tops also look flat like tables; and the small islands often assume a flower-pot shape, being expanded above, and seeming narrow at the base, near the water. In one instance, the islands of Bic and Bicquette seemed to join; the wooded tops appearing to meet, and leaving an arch beneath, through which the water of the narrow channel, that seperates them, seemed to flow. The spray on the beach sometimes seems to rise in foam to the tops of these imaginary cliffs; and the houses, and other objects on the shore, seem to attain a great height, and like the trees, almost all to reach the same elevation.

The appearance of the surrounding ships (for at this season there is almost always a great number passing up and down the St. Lawrence) is still more distorted. The appearances differ much; owing, apparently, to the ships being more or less remote. Sometimes, they appear to rise to

twice their usual height; whilst at others, the masts seem to reach to a few feet only above the deck. The more distant, in one case, was extended to a great height; whilst one nearer was so shortened, that I mistook it for the Halifax steam vessel, then expected from Quebec. Sometimes the upper sails seem double, a second set being seen at a considerable height above the vessel; and sometimes a second ship, hull, sails and all is seen above the first. In no instance, however, have I seen an appearance of inversion either in the upper or lower figure. Nor was the picture ever seen, without the vessel itself being visible at the same time. The houses and other objects on the land never seemed shortened, as the ships did occasionally; perhaps this was in consequence of their distance, as our vessel generally lay far from the shore.

There was generally with the mirage an appearance of a fog bank on the horizon, more particularly to the eastward; perhaps because the sea being open in that direction, the horizon was there better marked. The air within the horizon was at the same time perfectly clear. At times, instead of the bank, the horizon seemed only elevated; or there was an appearance of a double horizon. Sometimes of an evening this bank, or the elevated horizon, would reflect the light like a mirror. All these unusual appearances were generally lost on ascending the rigging from ten to thirty steps, when objects were seen in their natural shapes. The fog bank may perhaps be an exception, for I have never observed what effect ascending the rigging would have on its appearance; nor have we ever had an opportunity of ascertaining whether the fog really existed, or whether it might not be an appearance that would recede as we approached. Can it depend on the precipitation of

particles of water near the surface, so minute, as only to be visible at the horizon, where a much greater depth of them is in the line of vision? Would the presence of such minute particles of water in the atmosphere cause the peculiar refraction? From the change produced by the elevation of the spectator, it is possible that persons on the quarter-deck, or poop of a line-of-battle ship, or large frigate, being placed at a height so much above that of our surveying schooner, might pass some time in the St. Lawrence, at a favorable season for seeing this mirage, yet never witness its phenomena. On the 17th of August, 1831, near Manitou river, between Seven Islands and Mingan, during the mirage, which occurred in a calm with a considerable swell of the sea, the appearances presented by two small islands or rocks, at different distances from us, was very remarkable; for as the vessel rose on the wave, the more distant seemed to sink, and the nearer to be raised up; and again as the vessel sank, the first rose, and the near one was lowered. Even the different parts of the same island were variously affected, appearing to dance as the vessel rose and fell.

Sometimes the refraction was so great, that ships, passing or laying close to us, had a distorted appearance. In one case, the water seemed raised about a foot above its level, where it came in contact with a ship at anchor close by.

The mirage, which I have been endeavouring to describe, is seen chiefly in the early part of the summer, when the waters have not acquired a temperature approaching that of the air; but as the seasons advance, the air and surface water become in an opposite state. For now the water, draining off from the lands, warmed with the accumulated heat of the summer's sun, acquire a temperature greater than the average temperature of the air in the fall, and

consequently much above its dew point in clear weather. This state is also attended with a mirage, but it presents very different phenomena from those already described. The points of land, and distant trees, growing in low situations, seem raised above the horizon; but there is no evident alteration of their shape, nor of their relative elevation. The appearance of walls, precipices and table lands, so conspicuous in the former case, are never witnessed in this; but the horizon and sky seem interposed between you and distant objects, a phenomenon which is never observed in the other form of mirage. In fact, the whole of the phenomena, in this instance, seem to depend on the shortening or depression of the horizon; a circumstance which struck me particularly some years ago, in observing the Egyptian mirage, with which this latter, though of much less intensity, precisely corresponds.

Several travellers have noted the curious phenomena of the Egyptian mirage, the most remarkable of which is its assuming the appearance of a tranquil lake, in the midst of the desert. The deception is at first complete. The hills in the desert, and the trees and houses also, when it occurs in the cultivated parts, are seen elevated above its level, and reflected from its smooth surface, which extends in some directions as far as the sight can reach. But when, on looking at it attentively, you search for the line of the horizon, where the supposed water meets the sky, it is not to be found in the usual place. The hills, &c. are seen in the air; and tracing carefully from the more remote to the nearer points, you find that the horizon is really what you at first took for the near margin of a lake.

This connexion between the sky and the mirage could not be traced, perhaps, when the latter is observed, as

sometimes happens in a valley bounded by distant hills; as these interfering prevents our tracing the connexion. Neither would the irregular margin, which is caused by the unequal surface of the ground near the observer, readily suggest any idea of a horizon.

The part of the sky, in this case, placed between lofty objects and the shortened horizon is often very bright and shining; it then acts like a mirror, reflecting a picture, more or less perfect, of every object that rises above its surface. From this reflection, white houses on the shore sometimes seem lengthened, but the case differs altogether from the mirage first described; as the lengthening here is owing to the inverted image, whilst in the other there is only a simple elongation of the object, without any inverted picture.

Having heard (I think it was) the late Professor Playfair, in the year 1817 or 1818, account for the phenomena of the Egyptian mirage, by the diminished refracting power of the air at the surface, in consequence of its being rarified so much, by contact with the burning sand, as to become specifically lighter than the superincumbent stratum, I was at first satisfied that the principle could be applied to the mirage of the St. Lawrence; as the objects on the beaches and shore, under the influence of a hot sun, were the first that attracted my attention. But when I saw the ships also distorted, between which and me there was no heated surface, this explanation would not apply; and above all when I found that, on mounting some distance in the rigging, every object on the shore, even those much above my level, was seen in its natural shape, I became convinced that the cause of distortion did not exist on the land, but near the surface of the water: I examined the

temperature of the water, in order to try what inferences might be drawn from it, and finding it much colder than that of the air, I concluded that the unusual refraction, which certainly differed from the Egyptian mirage, depended on the stratum of air next the cold surface being cooled by the contact, and thereby rendered unduly heavier than that above it; and that the refraction depended on this disturbance of the usual arrangement. With this explanation, I rested satisfied for some time; but, as I kept a constant register of the temperature of the air, and a frequent one of that of the surface water, I was surprised occasionally to find the mirage appear, when the difference between these was not many degrees; whilst, at other times, under the apparently favourable circumstances of light winds and a clear sky, it did not appear, though the temperature of the water was considerably lower than that of the air. The second mode of accounting for the phenomena, was therefore nearly as unsatisfactory as the first.

During last summer, my attention was first directed to the connexion between the dew point of the air and the temperature of the surface water, in cases of mirage, by observing that the one just described, appeared to a very great extent immediately as the fine weather fog was dispersing.—(We had long before ascertained that this fog was caused by the air resting on, or slowly passing over a surface, whose temperature was below its dew point.) The appearance of a fog bank, that so often during this mirage seems to stretch across the horizon, with its equal elevation, which appeared to bear some relation to the table appearance of the distorted objects, gave strength to the opinion that both depended on the same cause; as did the fact, that in many cases both could be overlooked by

ascending to a height in the rigging. Numerous experiments made since that time, tend to confirm the opinion then formed. And on a reference to our meteorological journal for the previous years, in the few cases in which the mirage happened to be noted, as well as the temperature of the water, and dew point of the air on the same day, this relative state of both was invariably observed.

The second form of the mirage I first noticed, *particularly* at Mingan Harbour, at 11, A. M. on the 29th of August last, when I was surprised to find that the temperature of the surface water, though lower than that of the air, was higher than its dew point. The temperature of the air was 57°, its dew point 45°, the surface water 48° ; a very light air from the westward, oil barometer 30,52, (probably 15 or 20 higher than would be indicated by a good mercurial one.) I was a good deal perplexed with this at first, as my previous experiments on the mirage had shewn the relative state of the dew point and surface water to be quite the contrary ; and I repeated the experiment, to be certain whether there might not have been some mistake in ascertaining them, but the results were the same. I now remarked that the mirage itself exhibited totally different phenomena, from that I had previously been in the habit of observing. The distortion of form—the walled extremities —the flattened tops of the islands and headlands—the fog bank on the horizon, or double horizon, were all wanting. The shape of objects was not at all changed. The horizon, instead of seeming raised, was actually depressed ; a rock left bare by the ebb tide, at a distance of 3½ miles, as well as an island 10 miles distant, seemed lifted into the air ; and the points of other nearer islands and head-lands had the same appearance. Every circumstance, in short, reminded

me forcibly of the mirage I had seen in Lower Egypt, in 1827. The following notes, on both forms of mirage, were made on the 30th, and following days, at the same place.

9, A. M.—The appearance of the rock, and outer (or distant) island, and the points of the near islands and main to the eastward, is the same as yesterday morning. All seem lifted up above the horizon. The portion of reflected sky between the inner islands and the vessel, resembles a perfectly smooth lake. Almost calm. Air 53°, dew point 49°, surface water 51°, oil barometer 30,59. As yesterday, there is no distortion of any of the objects; they are seen along the coast, with which the harbour island runs nearly parallel, the channel between them being very narrow, and receiving the waters brought down by the Mingan river. There is no mirage to the westward, where the sea is comparatively open. The mirage disappears on ascending a few steps of the rigging.

11, A. M.—The appearances continue the same. Air 60°, dew point 49°, surface water 53°, deep water (7 fathoms) 48°. A very light air from the westward.

0,30, P.M.—A breeze has sprung up, and the mirage has disappeared as far as it affected the rock and the land inside it. The rock seems now within the horizon, but the point of the near island, (7 miles distant) and the whole of the distant one, seem still raised above it.

1,45, P. M.—The wind has been gradually freshening, and the mirage disappearing in the same proportion; it was last perceptible at the outer point of the near island. Air 61°, dew point 49°, surface water 50°,5. Fresh breeze from the west ward—atmosphere clear.

At 3, P. M. on the 1st September, at the same place, we had the mirage with distortion of objects. It appeared first

to the eastward, and then to the westward, and did not last more than 15 or 20 minutes. The trees on the points took the hedge row appearance; the shores began to look walled; and one of the Paroquet islands assumed the appearance of a flower pot. Air 65°, dew point 59° 5′, surface water 56°, oil barometer 30° 45′, almost calm. A fresh breeze from the eastward sprung up towards night. A similar appearance had been observed to the eastward, only during a calm, on the morning before at 9 o'clock; it remained but a short time, and I had not then leisure to examine the temperature of the water, &c. A little before 10, after it had disappeared, the air was 61°, dew point 55°, surface water 54°. A very light air from the westward.

We left Mingan on the 6th of September, and I had again an opportunity of observing the mirage, with distortion, at Bic, on the 12th. The air was 48°, dew point 42°, surface water 40°.

On reaching Crane Island on the morning of the 16th, on our way to Lake St. Peter, the mirage, with shortened horizon, was observed on every side. We had now got into fresh water, with a temperature of 62°. The air at 9, A. M. was 50°, and did not, during the day, acquire the temperature of the water; the dew point was 40°. From this time forward, the mirage, with shortened horizon, was almost daily observed. The general temperature of the water, during the remainder of September, was 62°; the average temperature of the air at 9, A. M. 54°, the dew point 48°. There was no record kept of the heat of the air at any other time of the day; but I remarked that the mirage was most strongly marked, and the horizon shortest, during a calm on the warmest day that occurred in the month of September.

At anchor, near Isle Plat, on the 15th October, at 2, P.M. the air was 53°, dew point 37°, surface water 52°. A light breeze from the westward. The mirage, which had been very great during a calm, with cold air in the morning, (the temperature had been as low as 44°,) still continued, though in a less degree, the horizon having receded considerably. The same appearances were observed on the 16th: air at 9, A. M. 50°, surface water 53°, calm. At noon, air 54°, surface water 53°, a light breeze. When the mirage was less distinct in the warmer parts of these days, the examination of it was much facilitated by using a telescope; by the help of which, the line of the shortened horizon could always be readily traced. It also showed more distinctly the inverted picture of distant objects, formed by the reflected sky, between them and the shortened horizon.

Quebec, November 18, 1831, at 2, P. M. wind westerly, light, sky overcast, (the morning had been clear,) temperperature of the air 42°, surface water 42°,5. The mirage, with shortened horizon, was seen from the King's wharf between the island of Orleans and the main. On descending the steps to the surface of the water, a schooner between the near end of the island and the main seemed raised above the horizon. There was no opportunity of observing the dew point at the time, but it must have been much below the temperature of the surface, as there had been frost in the morning, and the thermometer fell to 33° again in the evening, without rain.

I noted this form of mirage, for the last time, from the King's wharf at Quebec, on the 27th November, at 1, P.M. The air, which had been 27° at 9, A. M. was now 30°, the surface water 38°, the wind fresh from the eastward, and the surface much agitated. The shortening of the horizon, and the apparent elevation of the points of distant land

were well marked. The houses on the near end of Orleans were reflected as in a mirror.

During the course of these observations, I was ignorant that any cause was assigned for the appearance of mirage, except great excess of the temperature of the surface, over that of the superincumbent stratum of air; I consequently neglected to record some observations of the occurrence of mirage with shortened horizon, when the temperature of the air was greater than that of the water. Neither did I, at that time, know that the shortening or depression of the horizon in this case, had been previously noted. It was, however, so remarkable a feature, that I distinguished this in my notes as the mirage with shortened or depressed horizon, whilst the other was designated the mirage with elevated horizon, on account of the contrast between them; or more generally the mirage with distortion, from the altered form of all the objects which were observed during its continuance. Finding, accidentally, that the subject had been discussed by Baron Humboldt, I referred to his work on my return from our cruize.

In the note D on the subject, in the 3d volume of his Personal Narrative, are many measurements, which shew satisfactorily that the horizon is really depressed, or shortened to a considerable extent; and that the different objects that seem lifted into the air, have also their apparent elevation changed, though in a much less degree. Contrary to what they appear, they are depressed instead of being raised, the angle with the zenith being increased. In summoning up the results of his observations, he says, "The oscillations of the horizon were 7′ 57″; those of the summit of Picuita* 2′ 25″; those of the summit of Boracha† 0′ 27″.

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* A small island. † Another small island.

The usual depression of the horizon, independent of any refraction, ought to be 5′ 29″; I found it between 6′ 10″ and 14′17″." Having ascertained that near the equator the surface of the sea is 1° or 1° 5′ (centrigade) warmer than the surrounding air, he considers this difference of temperature considerable enough to be looked on as one cause of the mirage, as it had been observed on the banks of the Elbe, when the water was only 2° of Fahrenheit (0° 8′ cent.) higher than the air.

This explanation would perhaps be satisfactory, if the temperature of the surface was always greater than that of the air, when this species of mirage is present. But the contrary very often occurs, even in the observations recorded by Mr. Humboldt himself. In the instance already related of its appearance at Mingan, the temperature of the air was on the first day 57°, that of the water 48° 5′. On the following day the mirage was equally well marked at at 11, A. M. when the air was 60°, and the surface water 53°; as it was at 9, A. M. when the air was only 53° and the water 51°. On these occasions the utmost care was taken to obtain the exact temperatures, free from any local cause of disturbance. That of the air was obtained by holding a thermometer at arm's length, with the bulb turned away, exposed to the wind, and without the shady side of the vessel. The temperature of the surface water was ascertained either from water drawn in a bucket, and examined instantly on its coming up, or by a register thermometer suspended over the side. When the former mode was used, the bucket was twice filled before the water was examined, in order that its temperature should not be influenced by that of the vessel. The following, from Humboldt's Note D, already referred to, are to the same purpose. He obtained the

angle with the zenith, by means of "a bird's quadrant divided into 96°, every degree of which is equal to 56′ 15″, the vernier subdivides the degree into 120 equal parts. The error of collimation 8′ 40″ (sexages. division) to be added to the zenith distances."

"1st Sept. 1800, at *23h. 10′.—The points of the islands and capes all appear elevated, suspended. Therm. in the open air in the shade 22° 6′; R. Deluc's hygrometer 45° 2′; the sea water 21° 4′; the sand of the plains between the town and sea 30° 8′ R.; depression of the horizon of the sea 95s 58′ 30″.

"The 4th Sept. at 5¼ h.—Cloudy, air very transparent, therm. 22° 5′, hygr. 41° 2′. The water of the sea at its surface 21° 8′. White sand on the shore 28° 5′. Depression of the horizon 95° 58′.—All the capes suspended, but the suspended part is only 5 or 6 minutes in length. Picuita is entirely in the air, its apparent length 0° 11′ 15″. At sunset the interval between the base of the island and the horizon of the sea diminishes as the horizon gets darker.—When the disk of the sun is hidden behind very dark clouds, the centre of Picuita rests on the horizon, the extremities of the island are then alone suspended.

"The 24th Sept.—Since the 18th, sky constantly clouded. The weather changes on the night of the 23d. Great transparency, the stars very brilliant, but not twinkling, even at the horizon. The 24th, great dryness, hygrometer at 21 h. morning, 32° Deluc, (67° Saussure,) therm. 21° 5′ Reaum. Depression of the horizon, the greatest I ever observed. Water of the sea 22°. The arid soil of the shore 32° 7′. Boracha is entirely in the air. The depression

* From noon.

of the horizon 96° 12′,† consequently 8′ greater than on the 4th September. Picuita often appears double, and inverted during the remainder of the day. At 22 h. therm. 23° 5′, hygr. 31° 5′. Depression of the horizon 96° 0′. At noon the depression of the horizon is still 96° 1′. Dead calm.

Here on the 1st of Sept. the air was 2° 7′ of Farenheit higher than the water; on the 4th, 1° 5′. On the 24th, at 9, A. M. it was 1,25 F. lower, but it rose at 10 h. to a 3° 9′ above it. The heat of the air at noon is not given, but it is probable that it increased very much during the calm, as the day advanced; while the surface water would not acquire by any means an equal increment. The mirage, highly marked, continued for the remainder of the day.

The object to which I would wish particularly to direct attention in these extracts, is the state of the hygrometer, and of the wind when it is given: as on these I am disposed to think the phenomena for the most part depend; for it is evident they could not be caused by the surface water being warmer than the air in these cases. The greatest difference of depression of the horizon was between that observed on the 4th and 24th. And the chief points of difference in the relative states of the atmosphere, was the greater dryness indicated by the hygrometer on the latter day; the clearness of the sky, and the calm.

A dry state of the atmosphere greatly facilitates the process of evaporation; and if there is a calm at the same time, the watery vapor will in some degree accumulate in the stratum of air next the surface; or, at least, the nearer any stratum of air is to the surface in this case, the greater will be the proportion of watery vapor contained in it.

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† 1-120 parts of a degree.

Hence, as the specific gravity of watery vapor is less than that of air, the lower strata will be less dense than the strata over them, as far as the immediate effect of the evaporation extends. If the rule, which regulates the refraction according to density, holds in this case, the lines of light passing from any object to a spectator, will be curved with the convexity downwards. That such a difference of density exists in the Egyptian mirage, I believe has been generally admitted: the lower strata of air being supposed to be expanded, and rendered less dense than those immediately above them, in consequence of the heat imparted by the burning sand. This explanation, however, cannot apply to the numerous instances of mirage seen over the surface of water, which is frequently only a few degrees warmer than the air; and is wholly inapplicable when the air is warmer than the surface, as in the cases already related.

The air may be in this form of mirage, sometimes above, at other times below, the temperature of the surface; but I believe its dew point will always be found lower. The extent of the shortening of the horizon, and the other phenomena connected with it, will be in proportion to the difference between the heat of the surface, and the dew point of the air in the first instance, as affording greater or less facilities to the formation of watery vapor; and in the next place, to the more or less agitated state of the air, by which the vapor is either allowed to remain near the surface, or is mingled with the general mass of the atmosphere.

The existence of the mirage in the sandy deserts, where no water is to be seen, may be urged as an objection to the mode in which I have endeavoured to account for its presence. But some of the places where it was observed in

the greatest perfection, both by Humboldt and Burkhardt, had been overflowed during the previous season; and though the surface was arid and heated, yet the deeper sands probably still retained much moisture. The heat communicated from the surface would gradually convert this into vapour, which would find a ready escape through the sand. In some parts of the desert brackish, or salt water may be found, merely by thrusting a stick into the sand; and in many, I believe, by digging to some depth. However, if the mirage of the desert, where the sand is often upwards of 20° hotter than the air, should be found to arise wholly from this cause, independent of evaporation, that does not affect the explanation of the mirage over water, the temperature of which is sometimes higher, and at others lower, than that of the air in contact with it.

I must now return to the mirage first described, the phenomena of which differ altogether from the last. Of these I shall recur to a few which strongly mark the difference between them. In the one we have been just considering, the horizon was always shortened or depressed; in the present, it seems invariably elevated. In the former, the picture of objects, which was frequently seen, was inverted, lay close to the object itself, and seen beneath it, or between it and the spectator; in the present one, I have never seen it inverted, and it is always seen above the real object, a considerable space occasionally intervening between them. In the one, objects are seen in their natural form; in the other, they are lengthened, or shortened, or horizontally distorted. In the one case, the reflected sky, which, from the shortening of the horizon, intervenes between the spectator and the object observed, reflects the latter, in the same manner as a mirror, or a perfectly still

sheet of water would do; in the other, there is no reflection of this kind, but the second object, when it is perceived, is seen, more or less perfect, above the real one.

The relative states of the surface and the atmosphere differ as remarkably as the phenomena just noticed. In the mirage with elevated horizon and distortion of objects, the temperature of the surface was always found lower than the dew point of the air, and the extent of the phenomena generally bore a relation to this difference, while it was short of that, which, by precipitating water in drops, occasioned the fine weather fog. Like the mirage with depressed horizon, it was much influenced by the wind, appearing in a calm, when the difference was only a few degrees, and not being seen when the difference was greater, if the wind was fresh. I have, however, seen both forms of mirage during very fresh breezes; in the one case, when the dew point was much below, in the other, much above the temperature of the surface water.

The extent to which the horizon is elevated in the mirage, I have as yet had no means of ascertaining by direct experiments, for want of suitable instruments. But an experiment made by Captain Bayfield, in July, 1829, at Anticosti, for the purpose of trying what trust could be placed on observations for time made with the natural horizon, bears strongly on the point, and shews that the apparent elevation really exists. By comparing the results of two sets of observations made, one immediately after the other, with the utmost care, on the forenoon of the 25th July, 1829, at Cape Henry, Anticosti, the result from those made with the natural horizon gave 32″ less time than those with the artificial. This difference of time, computed at the rate at which the sun then moved, was equal to

3′ 24″ of elevation; consequently, the natural horizon was then elevated to that extent. On this day, the temperature of the air, noted in our journal, was 56°, the dew point 51°; that of the surface water is not noted for the day, but I infer that it was 42°; as, on the 23d it had been 50° 5′, on the 24th, 46°, and on the 26th, 38°, the reduction being owing to a fresh breeze from the westward, which continued to blow, with little intermission, for the entire four days. At the time of the observations, the horizon was well defined, and there seemed no reason to expect any extraordinary refraction. The experiment was made for the purpose of trying what could be done under apparently favourable circumstances. In the subsequent part of the day, the mirage was observed, and excited suspicions as to the results, which were confirmed when the sights came to be calculated.

Our meteorological journal for 1829 and 1830 is defi cient, generally, in the precise statement of all the facts respecting the air and the surface, which I am disposed to think occur in cases of mirage. In the first year, the mirage is not generally noticed; and in the second, we kept no record of the dew point, as we could not procure ether here sufficiently pure for the experiments. As far, however, as a judgment can be drawn from the imperfect data, viewed in all their bearings, the states of the air and surface correspond with those observed in 1831. Of these, the following only, of which particular notes were taken, are submitted; as, in them all, the subjects connected with the mirage were noted.

July 16, 1831.—At anchor between the Razades * and

* Rocks near the shore, and not far from the anchorage.

Bic, at 3½, P. M. a fog, which had covered the surface of the water for four hours, was melting away, The island of Basque* had its lower part enveloped in it, while the upper part was raised by refraction. The Razades had no fog or mist surrounding them, but were raised by mirage, in the usual way. A vessel, apparently on the border of the mist, seemed to have its masts and sails continued to an enormous height. Other smaller craft, nearer, were not at all distorted. On looking again, after a short time spent in examining the hygrometer, the fog had considerably diminished, the Razades and vessel resumed a natural appearance, the wall of fog round Basque was gone, but some mirage had taken its place, raising the shores to the semblance of a wall, but not affecting the higher parts of the island. Another vessel, to the northward, where the fog still continued, was partly hidden by it, and what was visible was much distorted, the distortion becoming less as the fog dispersed. Wind light; air, 54°; dew point, 47°; surface water, 43°; at 9, A. M. the air had been 48°; dew point, 46°; surface water, 40° 5′.

The fog returned between 6 and 7, P. M. and the islands on its verge, Basque and the S. W. Razade, were again thrown up; with an appearance on the latter, as if the spray of the sea reached as high as its top; the N. W. Razade, which was seen within the fog, had a natural appearance. The vessels in the offing, to the northward, on its edge, were partly distorted; one seemed to have two sets of jibs. The upper, which appeared on the level of the topgallant sail, seemed to be inverted; but, as a jib is triangular, it is not easy to ascertain whether it was so, or

* An island some miles farther to the westward.

not. Bic was for a long time thickly enveloped with fog, round its base, the top of the island shewing naturally above. Between 7 and 8, P. M. the fog dispersed in a great measure, from the lower part; and then it assumed the walled appearance which characterizes the mirage.

July 18.—The fog again today was followed by mirage, as on the 16th; one vessel, in the offing, seemed without masts; whilst others, somewhat farther off, seemed raised to an enormous height. On going up about two-thirds of the main rigging, the distorted appearance of the distant land ceased, whilst the shore near to still seemed thrown up, the same as on deck. The height, to which the latter seemed raised, was not great in either situation. On several other occasions, the distortion of the near shores was not perceptible from a moderate height in the rigging.[1]

Off Manitou River, Aug. 17, at 3h. 30m. P. M.—Air, 53°; dew point, 47°; surface water, 42°. The mirage on this occasion has been already described (p. 12). On the following day, there was no mirage. The air was very clear; temperature at 9, A. M. 59°; dew point, 36°; surface water, 41°; wind, N. W. fresh in the morning, but gradually subsiding.

The following are from the general meteorological journal:—

Bic, June 17.—Air, 54°; dew point, 48°; surface water, 43°; wind moderate. Mirage.

Mingan, Aug. 25.—Air, 57°; dew point, 52°; surface water, 48°. Wind, W. fresh. A slight appearance of mirage.

Aug. 26.—Air, 58°; dew point, 53°; surface water, 50°. Wind and mirage as yesterday.

Aug. 29.—Air, 53°; dew point, 42°; surface water,

49°. Wind, W. light. Mirage, with shortened horizon, differing altogether from the one previously observed during this year.

Aug. 30.—Air, 51°; dew point, 49°; surface water, 50°. Calm. Mirage, with the same phenomena as yesterday.

Aug. 31.—Air, 61°; dew point, 55°; surface water, 54°. Wind light. Mirage, with distortion.

Sept. 1, 4, P. M.—Air, 65°; dew point, 59°; surface water, 56°. Wind E. light. Mirage, with distortion.

Sept. 12, W. of Bic.—Air, 48°; dew point, 42°; surface water, 40°. Wind S. W. moderate—distant headland of Bic refracted with a walled appearance, which it retained at a height of two-thirds of the main rigging.

Passing up the river, we saw no more of the mirage with elevated horizon; that with the horizon depressed was observed when we reached Crane Island, on the 16th Sept. and almost every day for the remainder of the season, when we were in situations commanding a sufficient extent of prospect along the water.

It will probably be easy for persons familiar with optical demonstrations to account for the contrary curves taken by the rays of light in these two forms of mirage. In the one with elevated horizon, where the curves have their convexity upwards, the air on and near the surface, being cooled by the contact, is depositing watery vapour, and, from both causes, becoming proportionably more dense. The table appearance of the low land, and the seeming general level of all objects on or near the shores, as well as the level fog bank seen on the horizon, and the disappearance of mirage when we ascend to some height, all shew that the change in the state of the air, which causes it, is

confined to a certain, and tolerably equal, distance from the surface; and a sort of stratified appearance of the refracted shores would seem to indicate a succession of strata of different densities within this elevation. Or if a conjecture, hazarded in p. 11–12, is correct, and it seems to me the more probable cause, there is a succession of strata of air, in which minute particles of water are suspended, in different proportions. Can the occasional flower-pot appearance of rocks and small islands, in which the curves of the rays from the elevated parts are lateral or horizontal, be owing to the heated shore between the higher ground and the water, causing a state of the air over it, differing altogether from that of the air which rests on the cold water? This appearance, as well as I can remember, was only seen when some extent of low shore intervened between the more elevated land and the water.

In the mirage with depressed horizon, where the convexity of the curves is towards the earth, the air near the surface is acquiring watery vapour more or less rapidly, and becoming proportionably less dense. This effect will be increased when the temperature of the air being beneath that of the surface, the lower stratum of air not only receives an accession of watery vapour, but is at the same time warmed by the contact.

The rays of light which, in the latter, form the reflected sky, seem to be chiefly those that reach the surface at a great angle from the perpendicular, and are consequently most readily reflected, or refracted; for when an island, or headland near the horizon, consists of a low flat centre, with elevated extremities, as Crane and Goose Islands, the reflected sky or depressed horizon will be seen between the spectator and the low land, whilst it will not be observed

in the line of the higher points, though more distant, and consequently more favorable for its appearance. The remote line of the reflected sky in this case, corresponds with the varied elevation of the lower land, and not with its form at the level of the water. This seems also the reason why the extremities of islands, generally lower than their centres, and the points of headlands, appear raised. The inferior outline of the raised points, corresponding in a great degree with the superior, and the raised part is shorter or longer, as the point is more or less steep. The disappearance of the mirage, on the spectator reaching an elevation much above the level of the water in both cases, seems to prove that it is only the rays that pass near the surface, that suffer any considerable refraction. When, in consequence of the height of distant hills, the reflected sky was not observed in the direction in which they lay, I observed the hills to have that rich purple colour, so much admired in autumnal landscape, and this color seemed to depend on the state of the intervening air. Can it be that, in this case, the purple rays, being the most refrangible, are reflected by a medium that is not powerful enough to reflect the remainder of the rays constituting white light, in consequence of the angle of incidence not being sufficiently great.

If the forms of mirage, that have been here described, depend, as I suppose, on the difference between the dew point of the air and the temperature of the surface; or, in other words, on the formation or precipitation of watery vapour, it becomes an interesting subject of enquiry, whether the elevation and depression of the horizon, which characterizes them, bears any constant ratio to the relative states of the atmosphere and surface, when the phenomena of

mirage cannot be perceived. The observations I have had an opportunity of making, lead me strongly to think that such is actually the case; and the only measurement we have, that made by Captain Bayfield, at Cape Henry, Anticosti, tends to confirm the opinion.

As the accuracy of the result of many operations in nautical astronomy would be greatly increased, if the circumstances affecting the natural horizon, and consequently the apparent elevation or depression of celestial objects, could be clearly ascertained, the matter seems highly worthy of any attention that can be bestowed on it, and will probably form the subject of another paper on some future occasion, when, by means of suitable instruments, a sufficient number of facts and measurements can be obtained.

When the preceding part of this paper was laid before the Society, I had not had an opportunity of consulting any original papers on extraordinary refractions, except that of Humboldt, which is referred to; and I despaired finding any in Quebec. On examining the Library of the House of Assembly, however, which has been open since the close of the Session, I discovered that it contained a portion of the Philosophical Transactions, and the Memoirs of the French Institute. In the first, there are several papers on the subject—in the latter, I have as yet met but one by Mr. Biot.

As the causes of extraordinary refraction, assigned by some of the greatest philosophers in England and France, are directly at variance with those on which I have endeavoured to shew that it depends, it is necessary to refer to

those papers, in order to justify my dissent. At the same time I shall be enabled to connect the two forms of mirage, which I have observed, with those that are already known to the scientific world.

The first, in order of time, is Mr. Latham's. The extraordinary refraction enabled him to see the coast of France from Hastings, and to distinguish the colors on the heights, and the buildings. This was on a fine evening, after a very hot day. The weather, for some days previous, had been fine and clear.

Mr. Vince witnessed the phenomena of the mirage from Ramsgate, on the evening of the 1st August. From the water's edge, he could see the cliffs of Calais considerably above the horizon, although they are not often visible in clear weather from the hills. The ships in the offing presented, some double, some treble images. When there were two, the uppermost was inverted; when three, the second inverted; the upper erect. The real image was always the lowest, or next the observer. The refracted objects were all without the natural line of the horizon; those within it retaining their usual appearance. He observed several times a thick fog coming on the horizon from the opposite side, and rolling on it with prodigious velocity. There was no fog on the English coast—the unusual refraction was greatest to the eastward—the day had been extremely hot, the evening *sultry*, the sky clear, with a few flying clouds.

The mirages observed by Messrs. Latham and Vince agree in many respects: as the localities, which differed little; the time of the day; the warmth of the weather for some time previous; and the clearness of the sky. The only difference seems to be in the intensity of the phenome-

na. Both instances I can, without any hesitation, refer to the first form of mirage, which I have endeavoured to describe; that with an elevated horizon and distortion of objects seen. For the phenomena of this mirage is so familiar to us; it is so much an every day occurrence at certain seasons, that we can instantly and easily recognise it in any of its forms.

The mirage, described by Mr. Huddart, differed in no cirumstance from the mirage with shortened or depressed horizon, so common on the upper part of the St. Lawrence in the months of September and October. Mr. Huddart considered the extraordinary refraction to be the effect of evaporation, and explains the manner in which it affects the air, very much in the same way I have supposed it to do. The second image seen inverted *between the real object and the observer*, he attributes to refraction.

Mr. Vince attributed the mirage, which he saw, to the fog. As the strength or direction of the wind is not mentioned in either of the papers, it is probable the phenomena occurred during calms.

In 1799 Doctor Woolaston published his beautiful experiments, by which it was shewn that all the phenomena of mirages could be explained by the curves given to rays of light in passing through a transparent medium, consisting of a succession of strata, of different densities. From his experiments on evaporation, he came to a conclusion, that its effect would be to increase the refractive power of the air, with which the watery vapour is mixed. Hence he attributes the phenomena seen by Mr. Vince to evaporation, and those seen by Mr. Huddart solely to the temperature of the water being greater than that of the air above it, by which means the strata nearest the surface were expanded

by the heat communicated by the water, and thus rendered less dense than the strata lying over them. Evaporation, he considers, would have a contrary effect, by increasing the refractive power of the air. The little difference of temperature with the water, in many cases, and consequently slight effect in diminishing the density of the air in contact, he considered would be compensated by the extent and equality of the surface, along which the rays pass.

Notwithstanding our deservedly high estimation of Dr. Woolaston, as an experimental philosopher, and the deference which is justly due to his authority, I must venture to enquire into the circumstances of the experiments, on which his opinions of the effect of evaporation on the refractive powers of the air are founded, as they seem to have been received implicitly ever since.

A board 5 feet long was wetted with ether, alcohol and hot water from a sponge successively. With the first, the refractive power of the air over the board was so much increased, that objects seen through it were elevated nearly half a degree; with alcohol, 15′; with water, scarcely perceptible. But on running a sponge, wet with hot water, over a board 10 feet long, the refraction was equal to an elevation of 3′. When the vapour was confined by boards on each side, the refraction with the two first substances was greatly diminished; and when water was used, it became imperceptible. But on removing the side boards, so as to allow the wind to pass briskly over the wetted one, the full effect was again produced. Hence he infers that a light breeze is more favorable to the appearance of the mirage, that depends on evaporation, than a calm.

Passing over the experiments with ether and alcohol, both as foreign to our subjects; and as the density and

refractive power of the vapour arising from them is ascertained to be so much greater than that of air, let us examine that with the hot water. Here the first thing that meets us is, that the simple mixture of the watery vapour with the air, has no sensible effect, if it is confined over the surface that produced it. But in the instances of mirage already detailed, where the state of the air and water was most favorable to evaporation, the vapor formed must have been retained near the surface from which it sprung, by the very extent of that surface, and the absence of wind, for the mirage was always greatest in a calm, and was lessened by the lightest breeze. The hygrometic state of the air, or its temperature, are not noted in Dr. Woolaston's experiments: it may have been already nearly charged with moisture. Besides, when the surface water is very much warm than the air, *if there is a fresh breeze*, we have seen (p. 9) that a fog results apparently from vapor being formed in greater quantity, than the air can receive it under the circumstances; and frost smoke, which depends on the same cause, is a common occurrence. It is not improbable, from the heat of the water employed, that a state of the air approaching this kind of fog took place. Such a state would be exactly similar to that which seems to hold in the cases approaching to fog, where the water is colder than the dew point of the air, and where we know that the refraction of the air is greatly increased.

That the mirage described by Mr. Vince could not be owing to evaporation, I can have no hesitation in asserting, from having seen similar phenomena constantly attended with a state of the air and surface, from which deposition alone could result. And the fog observed by Mr. Vince is an almost convincing proof that such a state existed at the

time. The evening too is described as sultry, and it had been preceded by warm fine weather for some days. We frequently found that in such weather, the air becomes gradually changed with moisture.

The phenomena, in both Mr. Latham's and Mr. Vince's report, occurred in the narrow strait between France and England, where, from a strong tide meeting obstruction from the shape of the land, the cold deep water, from its greater density, is likely to come to the surface.

Observing that the rays of light passing through air in contact with a heated body, were deflected in the same manner as in the mirage described by Mr. Huddard, Dr. Woolaston attributes the latter, as already mentioned, solely to the effects resulting from the temperature of the surface water being higher than that of the air, which rests on it. That this cannot be the cause, is evident, as we have seen that a similar mirage occasionally occurs when the temperature of the air is equal to, or even much higher than that of the surface water.

The article on extraordinary refractions by Mr. Biot, in the Mem. de L'Institute, commences with a review of the descriptions and opinions previously published on the subject. He disapproves of Mr. Huddart's mode of accounting for the mirage he observed; as, from many reasons, he concludes that the admixture of watery vapour with the air, would rather increase than diminish its refractive power. (Tome x. p. 2.) In the same manner as Dr. Woolaston, he attributes the phenomena, in this instance, solely to the effects arising from the surface water being warmer than the air above it; and approves of his inference, that double images are owing to a variation of density contrary to that which ordinarily exists. (p. 7.) In the instance of

mirage described by Mr. Vince, he thinks the water was warmer than the air, and supports his opinion by referring to the temperatures recorded in London on the same day. These were at 7, A. M. 64° F.; at 2, P. M. 82° ; greatest heat 83°. As the following day was not near so warm, he supposes that the temperature of the air in the evening must have been descending fast, so as to become lower than that of the water, which is not liable to so quick a change. He does not seem to have comprehended the force of the word *sultry* used by Mr. Vince in describing the state of the air at the time. Thinks what Mr. Vince describes as fog was only the tops of the waves highly refracted.

In taking night observations on the coast of Valencia, Mr. Biot once saw a light on a mountain, in the island of Ivica, multiplied to three, four or more, all in a vertical direction, (at other times and places the light was only lengthened vertically.) In the morning, on looking in the same direction, the sea was seen covered with masses of mist. These mists did not exist the previous evening, but had been formed during the night. He afterwards constantly observed this circumstance, wherever the same phenomena of extraordinary refraction recurred. He does not think that the mist contributed to produce the extraordinary refractions, but that as it indicated a perfect calm, it ought frequently to accompany their appearance. (p. 15 and 16.) In his measurement of the dip of horizon, he found the depression much increased at the rising of the sun; and he remarks that the mirage with depressed horizon was greatest, ceteris paribus, when the barometer was highest. On the other hand, I find in the tabular account of his observations, that the horizon was most elevated on the 10th Feb-

ruary, when the observations were made with rain at hand, or in the interval of showers (p. 172 and 173). There is no record of the state of the hygrometer, but we know that a dry atmosphere generally, though not always, accompanies a high barometer; whilst the frequent showers are a tolerably certain indication of an air charged with moisture. Mr. Biot, however, considers that a knowledge of the relative temperature of the air and sea is all that is necessary for correcting the errors of the dip of the horizon.

The last of these papers, in which I find the effect of watery vapour on the refractive power of air considered, is that of Mr. Ivory in the Philosophical Transactions for 1823. He considers that the neglect of the effect of aqueous vapour can have little influence on the calculations for reducing apparent altitudes, as other disturbing causes have so much greater influence on the results. "Hawksbee (he says) first determined that air refracts light in proportion to its density; there is even good reason to think that this conclusion of Hawksbee is not materially affected by the various quantities of aqueous vapour contained in the atmosphere at different times." Again, on the uncertainty of the amount of refraction, he observes that "In the English surveys $\frac{1}{10}$ is allowed for terrestrial refraction—the French mathematicians allow $\frac{1}{12}$—it varies from $\frac{1}{2}$ to $\frac{1}{24}$. No reliance can be placed on the mean even of many observations, as it differs so much in different places. If we examine a set of observed refractions, it will be easy to discover instances in which the true refraction has diminished, when, according to the instruments employed, it ought to have increased; and the contrary. The real cause of such anomaly is undoubtedly the irregular changes that take place in the remote parts of the atmosphere,

which are not indicated by the barometer and thermometer."

If, in addition to the indications of the barometer and thermometer, the dew point of the air had been also noted, is it not probable that some light would be thrown on the cause of these discrepancies? I can only suppose that the influence of watery vapour in terrestrial refraction has been under-rated or overlooked, from the different effects it produces, when newly formed, and in the state of a perfect gas; and when returning from any cause to the liquid state.

I shall conclude this paper by extracting part of a table of the observations on the dip of the horizon, made by Captain Parry and Lieutenant Foster.* The original table contains observations in 1823 and 1824; but those for 1823 were useless to me, as there was no hygrometric register kept on that year. The dew point is not noted in the original table, as it is probable that there was no suspicion of any connexion existing between its temperature, compared with that of the surface, and the dip. In endeavouring to supply this omission, by giving the dew point for the days of observation, taken from the general meteorological journal, an approximation is the most that can be obtained. But as the changes of the dew point during the day are often very trifling, though the temperature may vary much, the dew point observed within an hour or two of the time of observation, cannot differ materially from what it would be, if observed at the exact time. The general result is in accordance with the views entertained in this paper, although some of the observations might lead to a contrary opinion, if the circumstances under which they were taken

* Parry's third voyage.

were not inquired into. On the 6th of June the temperature of the surface was below the dew point, and the horizon was elevated. On the 10th the same state existed in a greater degree, but the results of the observations varied, for in one of three sets of observations it was found depressed. The variable state of the horizon on this day is noted in the general remarks.

On the 9th of July, all the observations but one shewed an elevation of the horizon; but the temperature of the surface water, which was below the dew point in the morning, was above it in the afternoon. The situation of the ship, however, at this time, makes it very improbable that the temperature of the surface water towards the horizon, was near as high as it was found to be close to the vessel. In the morning there were several ice-bergs in sight, and the "pack" within eight or nine miles. In the afternoon the horizon was hazy, and ice-bergs near. Referring to the journal for this period, we find Captain Parry saying "Light northerly winds, together with the dull sailing of our now deeply laden ships, prevented our making much progress for several days, and kept us in the neighbourhood of several ice-bergs. We counted from the deck, at one time, no less than 103 of these immense bodies, some of them from 100 to 200 feet in height above the sea!" Under these circumstances, it is extremely unlikely that the surface water would be so high as 38° for any considerable extent; and the opinion is strengthened by finding that it was as low as 29° on the following morning. The different results of the two first sets of observations on this day, seem to accord with what I observed respecting the mirage that occurs in similar states of the air and dew point: namely, that the extraordinary refraction is often lost by

an increased elevation of the observer. The observations on the 10th and 11th shewed an elevation of the horizon, on one occasion, to the extent of 1′ 3″; the dew point was higher than the temperature of the surface water on both these days.

The extent to which the horizon was found raised, in these observations, is very small, in comparison with its elevation when observed at Anticosti by Captain Bayfield. The difference probably depends on the lower position of the observer in the latter case, (as he stood near the water's edge) and the greater difference between the temperature of the surface and the dew points, being about 9° at Anticosti, whilst in Captain Parry's observations it did not exceed 3°.

Observations on the Dip of the Horizon at sea, by means of Doctor Woollaston's Dip Sector, made by Captain Parry, R. N. and Lieutenant Forster, on board the Hecla, in the voyage for the discovery of a N. W. passage, in 1824.

Date, 1824	Time.	Observer.	No. of Observations.	Height of the eye in feet.	Dip. Tabular.	Dip. Observed.	Difference tabular being.	Temp. Air.	Temp. Sea.	Dew Point. 9 A. M.	Dew Point. 3 P. M.	Dew Point. 9 P. M.	Barometer.	Points of the horizon observed.	Wind. Direction.	Wind. Force.	Weather and Remarks.
	h. m.			ft in	′ ″	′ ″	′ ″	°	°	°	°	°	°				
June 6	10 00 A.M	P.	8	13 6	3 37	2 45,6	+0 51,4	52,5	49,5	51	52,5	52	30,24	N. by W.—S. by E.	S. S. E.	Moderate.	Cloudy.
10	1 30 P. M.	P.	10	15 0	3 49	3 17,5	+0 31,5	52	48	52	52	52	30,16	N. E.—S. W.	E.	... ...	Sea smooth; horizon variable; weather moist; horizon clear at the last observation.
...	... ...	F.	6	15 0	3 49	4 09,1	—0 20,1	52	48	...	...	...	... ...	... ...	... ...	... ...	
...	... ...	F.	6	15 0	3 49	3 42,5	+0 6,5	52	48	...	...	...	... ...	... ...	... ...	... ...	
July 9	8 00 A.M.	P.	20	19 0	4 19	3 42,2	+0 36,8	36	34	36	35	33	29,88	S. E. by S.—N. W. by N.	N. W. by N.	... ...	Very fine; several ice-bergs in sight; the "pack" 8 or 9 miles west.*
...	... ...	F.	6	22 0	4 37	4 37,5	—0 0,5	36	34	...	...	...	... ...	S. E.—N. W.	.. ..	... ...	
...	Noon.	F.	10	22 0	4 37	3 50	+0 ·47	39,5	36	...	...	...	29,82	N. W. by N.—S. W. by S.	... ...	... ...	
...	0 30 P.M.	P.	20	18 6	4 14	3 29,4	+0 44,6	39,5	36	...	...	...	... ...	... ...	... ...	... ...	
...	4 00	F.	10	23 0	4 43	3 57,9	+0 45,1	38	38	...	...	...	29,78	E.—W.	N. by W.	Fresh.	Sky clear above; hazy near the horizon; some ice-bergs near.
...	4 15	P.	10	19 6	4 20,5	3 19,7	+1 00,8	39	35,5	...	...	...	... ...	N.—S.	... ...	... ...	
10	11 40 A.M.	P.	12	19 0	4 19	3 48,4	+0 30,6	34	29	32	32	30	29,83	... ...	N. W.	Moderate.	Clear in zenith; clouded in horizon; ice in south horizon.
...	Noon.	F.	10	19 0	4 19	3 47	+0 32	34	29	...	...	...	... ...	... ...	... ...	... ...	
11	7 40 A.M.	P.	20	18 6	4 14	3 10,2	+1 03,8	33	30	33	33	30	29,70	S. E. by E.—N. W. by W.	N. W. by N.	... ...	Clear and cloudless; ice seen in N. W. by W.
...	9 00	F.	6	22 0	4 37	3 49,1	+0 47,9	33	30	...	...	...	... ...	N. N. E—S. S. W.	... ...	... ...	
...	... ...	F.	6	22 0	4 37	4 05,8	+0 31,2	33	30	...	...	...	... ...	N. N. W.—S. S. E.	... ...	... ...	

* There is a mistake in the original, both in the tabular dip of the first set, and the sign of difference. On the 8th, the dew point was 39° at 3, P. M. and 38° at 9, P. M. As it seems to have been falling gradually, it was probably a trifle higher than 36° at 8, A. M. of the 9th.

Specific Gravity and Temperature of the surface, and deep water, in various parts of the St. Lawrence, and at different seasons. The Specific Gravity corrected for the error of the instrument, and reduced to 50° Fahrenheit.

Place and Date.	Temp. of the Air, at 9, P. M.	Temperature of the water when taken up.	Depth from whence taken.	Time of Tide.	Specific gravity at 50°.	General Remarks.
	°	°				
Isle Plat, Oct 15, 1831	44	52	Surface.	No tide.	1,0003	
Quebec, Sept 12, 1830	52	61	... ...	3 h. ebb.	1,0006	
Grosse Isle, May 29, 1831...	62	57	... ...	4 h. ebb.	1,00044	
Crane Island, Dec 30, 1831.	58	57	... ...	2 h. ebb.	1,00034	
Do do do	...	.....	... ...	H. W.	1,0006	
Do do Sept 16.....	50	62	... ...	L. W.	1,0010	
Opposite the Pillars, June 6	62	60	... ...	L. W.	1,0007	
Do do do	70	62	... ...	H. W.	1,0017	Was slightly brackish.
N. Channel, off Malbaie, 9th	55	54	... ...	L. W.	1,0117	
Brandy Pots, Jan 29, 1830...	50	48	... ...	3 h. ebb.	1,0170	Sp.gr. the same at 5 hours flood, temp. 47°.
" July 9, "...	57	47,5	... ...	3½ h. ebb.	1,0178	
E. of Razades, June 26, 1831	49	42	... ...	3 h. flood.	1,0203	
Bergeron, July 5, "	62	40	... ...	1½ h. ebb.	1,0230	
E. of Red Island, July 5, "	...	42	... ...	3½ h. ebb.	1,0207	
West of Bic, June 26, "	49	46	... ...	L. W.	1,0182	
East of do, July 12, 1830...	59	46	... ...	4 h. ebb.	1,0204	Same in the flood.
Matane, 18, " ...	69	62	... ...	... ...	1,0189	
10 m. N.N.E of do. 8th, 1831	64	60	... ...	3 h. flood.	1,0180	Calm.
Do do do	65	54	... ...	5 h. flood.	1,0187	Wind W. freshening.
Do do do	...	35	30 fath.	... ...	1,0260	During the calm.
Do do do	64	34	50 fath.	... ...	1,0265	" "
Off Point des Monts, July 9	62	57	Surface.	5½ h. flood	1,0172	Calm, after much rain and fog.
" "	...	35	100 fath.	... ...	1,0275	
Trinity Bay, 10	52	37,5	Surface.	H. W.	1,0260	A gale from the W. the preceding night.
Bay of Seven Islands, Aug 3	61	53,5	... ...	4 h. ebb.	1,0202	
Ellis B. Anticosti, July 28, 1830	61	59	... ...	5 h. ebb.	1,0236	
Heath Pt. do Aug. 11, do	61	58	... ...	3 h. ebb.	1,0243	

ART. II.—ABSTRACT OF THE METEOROLOGICAL JOURNAL, KEPT AT CAPE DIAMOND, QUEBEC, FROM THE 1ST OF JANUARY, 1824, TO THE 31ST DECEMBER, 1831, WITH SOME REMARKS ON THE CLIMATE OF LOWER CANADA.—BY WILLIAM KELLY, M. D. SURGEON, R. N.

READ BEFORE THE SOCIETY ON THE 3D MARCH, 1832.

THE journal, from which the accompanying tables were extracted, has been kept with great attention and accuracy by Mr. Watt, in the citadel of Quebec. The citadel is elevated upwards of 300 feet above the level of the tide waters of the St. Lawrence, from which the rock it stands on rises almost perpendicularly. Two mercurial thermometers are used in making the observations. They are placed outside the windows of Mr. Watt's house, one of which has a north-eastern, and the other a south-western aspect. They are about five feet from the ground, and as much detached as possible in such a situation. In clear weather, one of them is always in the shade for some hours before the temperature is noted; and in the absence of sunshine, the temperature is taken from the one on which the wind blows. Both are always examined, and the lowest noted. From the attention and intelligence of Mr. Watt, I am induced to think that the temperature recorded is as free from the effects of communicated and radiated heat, as such a position of the thermometers would admit of. Besides the position is not without its advantages; for the facility of examination, in the winter, of this climate, insures an accuracy as to time, which could scarcely be expected, if

the observer had to leave his house for the purpose in seasons of intense cold.

The hours of notation are 6, and 9, A. M. noon, and 3, 6, and 9, P. M. I have selected 9, A. M. as coming nearest to the average temperature, from which I think it will only differ in a very trifling degree. I am not aware that any experiments have been made on this continent for ascertaining the hour, the temperature of which corresponds with the average temperature of the day. At Leith, it was found to be a little after 9, A. M. but it is probable the same hour may not exactly suit in other climates. At Quebec, it would seem to be a little before 9, A.M. if I can trust to a comparison I made between the temperature of that hour, for the last two years, and the average of all the temperatures observed for the same time.

If the temperature had been noted every third hour during the night, as well as during the day, the average would be sufficient for affording the mean. To supply the want of the two night observations, I doubled that of 6, A.M. to make it represent 3, A. M. also; and that of 9, P. M. for midnight. In this way I hoped a balance might be obtained; for as 6, A. M. is generally colder than 3, A. M. in the winter months, so 9, P.M. is not so cold as midnight. But in summer I feared this mode would give too great heat, especially during the period when the sun rises some time before 6 o'clock; as then 3, A. M. ought to be colder; and there is no balance during this period in the relative states of 9, P. M. and midnight; on the contrary, the estimating the latter by the former would increase the error. Though the results of the annual mean thus obtained, and the mean of 9, A.M. correspond so very nearly, yet, contrary to what I expected, I found that in the winter months the average

at 9, A.M. was lower than the average thus obtained, whilst in summer it was above it. Taking the mean of the two years, the annual temperature at 9, A. M. is 0,25 higher. And as I think whatever error may exist in the assumed temperatures, would rather tend to raise than depress the averages, it seems probable that it is at least so much higher than the general annual mean.

In the article on Climate, in the Library of Useful Knowledge, after stating that the mean for the day is at or about 8, A. M. the mean average temperature of the year, at Quebec, is given at 41°, which is considerably above what we find it to be at 9, A. M.

The remark of Humboldt, that Quebec has the winter of Petersburg, with the summer of Paris, conveys a good general idea of the climate, though it is not, and probably was not, intended to be, strictly accurate. Taking the mean temperature of Petersburg, as given in Malte Brun's Geography (and I can at present find no better source of information) at 3°,8 Centigrade, or 38°,84 F.* it seems to correspond very nearly with that of Quebec. But the winters are not, in general, near so severe, nor the summers so hot. The mean maximum cold at Petersburg, for 17 years, was —22 F.; at Quebec for the last 8 years, —31 ,37. In 1791, the greatest cold in the winter at Petersburg did not exceed 4,24 F. a mildness of season which I believe is never witnessed in Canada.

The mean temperatures of the months of June, July and August coincide very nearly in Paris and Quebec. That of Quebec at 9, A. M. by the present tables, is 63°,51; the average got in the manner already mentioned would make

* Vol. vi. p. 62—504, Trans.

it about 0°,9 less. In Malte Brun's table, vol. vi. p. 69, the mean temperature of Paris, given for the same months, is 17°,39 C. or 63°,30 F. Dr. James Clarke, however, in his treatise on the influence of climate on chronic diseases, states the summer temperature of Paris at 64,47. But Paris is not, I believe, subject to the sudden and extreme fluctuations of temperature that occur in Quebec. In the last year (1831) the thermometer at 3, P. M. on the 8th July, stood at 92°; on the morning of the 10th it was as low as 33°. Perhaps there is no part of the globe, where the range of the thermometer, either for a year or a week, is greater than in Canada. In the instance given above, the fall in the course of 36 hours was 59 degrees; in winter, changes to a still greater extent in the course of a day are not unfrequent. It has been known at Quebec to be from 36° to 40°, with rain during the day, and fall during the succeeding night to many degrees below zero. On other days, the change has been from a thermometer much below zero, to rain. I have been informed by Captain Bayfield, R.N. that at Penetanguishene he has known the temperature to be 40°, with rain during the day, and fall to —33° at night. The sudden arrest of the streams down the hill, on which the town is situated, had a curious and beautiful appearance.

In May and June, 1829, an early hot summer followed close on an unusually severe winter. Immense masses of snow still lay in the ravines towards the end of May, when the air in the shade was above 80°. At this time, being kept by circumstances on shore, I had an opportunity of marking the state of the air during its fluctuations, and perhaps what was then observed will apply generally. The heat began with a light wind from the westward, a high state of the barometer, and the dew point of Daniell's

hygrometer very low; for some days the heat gradually increased, in one instance to 91° in the shade. In the mean time the barometer was falling equally gradually, and the dew point of the hygrometer rising. The air, in fact, from being very dry, was becoming charged with moisture. At length in one case a thunder storm; in another, a gale from the eastward with heavy rain, reduced the temperature between 30 and 40 degrees. The intense heat, occasionally felt during the summer at Quebec, rarely continues many days, without an interruption from one or the other cause just described.

In like manner the intense cold of winter, which is always accompanied by a westerly or land wind, and a clear sky, is seldom of more than three or four days uninterrupted continuance. The more temperate intervals may be longer, or shorter, in different years or seasons, but they always, to a greater or less degree, moderate both the heat and the cold. They are the sure accompaniments of the easterly wind, when it blows from the sea; but when it does not extend so far, as often occurs in fine weather, its characteristics do not differ materially from the westerly.

The winds very frequently take the general direction of the valley of the St. Lawrence, that is S. W. or N. E. The westerly winds blow on an average 100 days in the year more than the easterly. The former seem to prevail most in January, July, September, October and December; the latter in March, April, May and June.

The westerly winds, blowing over an immense extent of land, bring the greatest heat in summer, and the most intense cold in winter. The easterly, when it comes from the sea, is of course more temperate in both seasons. It is supposed here, as in the eastern continent, to cause lassitude

and other uncomfortable sensations, perhaps in consequence of its being more moist. The cold of this wind in summer is often much greater than would be expected; sometimes bringing down the thermometer at Quebec between 40 and 50 degrees. This is owing to the mass of the waters of the æstuary and gulf of St. Lawrence being always cold. The surface sometimes acquires a heat of 60° from the fresh water keeping upwards, as is proved by its less specific gravity, and perhaps from the direct influence of the sun's rays. But the deep waters are always cold, and are brought to the surface when the water is agitated by a fresh breeze, particularly from the eastward, as the sea is open in that direction, and the swell consequently greater. The observations and experiments, from which this inference is drawn, are already before the Society. In addition to these I will only state, that at Tadousac, in September 1829, we more than once found the surface water as low as 36° after easterly gales, while we have reason to believe that, at the same time, it was at least 60° at Lake St. Peter.

To this constant coldness of the waters of the St. Lawrence, more than to any change of latitude, I am disposed to attribute the great difference in the temperature of the months of June, July and August, when the observations on board our surveying vessel are compared with those made at the same hour in Quebec. The difference is much greater in June and July each year, when we had not proceeded far to the northward, than in August, when we were off the shores of Anticosti, or Mingan. The extent of this difference may be judged by a comparison of the following means of the observations at 9, A. M. at sea and on shore.

	At sea, 1830.	*At Quebec.*	*At sea*, 1831.	*At Quebec.*
June.....	53°	58°	55° 3	66,46
July.....	60	65	58	68,60
August.....	60	62	59° 7	65,40

The greater difference in 1831 seems owing, in part, to the unusual heat of the season at Quebec; and also to greater attention having been given, on board, to prevent the thermometer being influenced by the heat of the vessel, when the observations were made.

The average number of days on which snow fell was 55. The greatest number I find was in 1828–9, when snow fell on 62 days; in the following winter, 1829–30, the days on which snow fell were only 49. These are extremes, but in general the number for any one year differed little from the mean. The quantity of snow, however, that accumulates on the ground in winter, differs very much in the different years, varying in the woods, where it lies most evenly, from 2 feet to 5 feet in depth. As the heaviest falls are with easterly gales; and the least evaporation, when the general temperature is low; a prevalence of these two states in a winter will be attended with the greatest depth of snow. Such was the case in the winter of 1828–9. The falls of snow with westerly winds are always light, and of short continuance.

The average number of days on which rain fell is 94. In 1831 it is 106, in 1825 only 75. Of the quantity, or depth in inches, we have no record. The rainy days were generally fewer on the years when the mean temperature was low.

The days with snow, and with rain, include all those on which the slightest fall of either was noted. Many included under those headings were consequently what is gene

rally considered fine weather. When snow and rain fell on the same day, it was put under both heads; hence the sum of these, and the fair days, is generally greater than the number of days in the year.

The average number of dry days is 222, the greatest was 239 in 1825, when the mean temperature was 36° 80. The least 207 in 1831, when the mean temperature was 39° 43. The mean temperature of the seven months in which rain mostly falls, from April to October inclusive, was 51° 87 in 1825, and 54° 9 in 1831.

The next subject in our tables are the thunder storms, which are very frequent during the summer months, but never occur in winter. They are seldom witnessed before April, or after September. They are in general attended by a depression of the barometer below the average, to a greater or less extent; but distant thunder was often heard with the barometer at, or above the mean. The frequency of these storms in summer, and their total absence during the severity of winter, may perhaps be accounted for in the following way. It is probable that the changes in the electric balance, that require a thunder storm for their adjustment, are in summer the consequence, in the first instance, both of evaporation, and vegetation; whilst the greater proportion of watery vapour in the air, conducts to the upper region the electricity evolved during these processes. In winter every thing is in an opposite state; there is no vegetation, and little evaporation, and the quantity of aqueous vapour diffused through the atmosphere is small. The non-conducting state of the air at this season is shewn by the facility with which sparks are obtained from an electric machine, and the electric phenomena which we frequently witness in our own persons.

The appearance of the Aurora Borealis was not noted during the first years of Mr. Watts' record, and perhaps not particularly attended to in 1828, when I first find it inserted. I have not been able to ascertain satisfactorily whether this might not have been owing to the variety of the phenomenon in those years. It probably occurs however more frequently than is marked in the register; for there is, in general, no notice of any atmospheric phenomena from 9, P. M. to 6, A. M. From personal observation, I think it is seen here more frequently in summer, than in winter; which militates against any idea of its depending on the cold of the climate. In the summer of 1830, during our cruize in the gulf of St. Lawrence, we frequently saw colored Auroras; an effect probably depending on the quantity of vapour in the atmosphere at that season, as we never observed them colored in winter. We did not observe them by any means so frequently, or so brilliant, and never colored, during the summer of 1831.

The notice of the state of the air as indicated by the hygrometer is very imperfect. The observations were made at different places as the surveying party moved, and in the first year the same hour of observation was not observed all through. The difficulty of obtaining a supply of ether here, of sufficient purity for the experiments, obliged me, in both seasons, to suspend the observations without completing them for the year. Besides, Daniell's hygrometer does not seem adapted to very cold climates. For (independent of the disagreeable exposure of the person of the observer) when the air is some degrees below zero, the application of ether to the bulb causes very little increase of cold. The ether seems as if thickened, and flows sluggishly over the silk cover; and the evaporation

is by no means brisk, even though the instrument is exposed to a fresh breeze. The lowest point at which dew formed in my experiments was —8°, with the air —4°. Cold it is true might be applied to the bulb by means of freezing mixtures, but I fear this mode would be found too troublesome for every day use. Captain Parry, by applying a mixture of muriate of lime and snow to one bulb, made the ether freeze in the other, reducing the internal thermometer twice to —46°, and once to —50°, without any dew being formed on the external surface. The temperature of the air in these experiments was —25° 5, —30, and —29°. Even in warm weather, it frequently happened, in a very dry state of the atmosphere, that so much of the fluid within the instruments was transported to the wetted bulb, before dew was formed, that the process of internal evaporation seemed at a stand, for no farther application of ether externally, caused either a greater lowering of the internal thermometer, nor a deposition of dew. I have never been able to carry the reduction of temperature, within the hygrometer, lower than 30 degrees, even with the best of two instruments supplied to the surveying party, and made by Jones.

The average height of the barometer at 9, A. M. for seven years, is 29,42 inches. The range during that time was 2,73 inches—from 27,90 in February 1824, to 30,63 in December 1829. The changes are frequent, and sometimes considerable in a short time: on the 7th of February, 1826, at noon, the barometer stood at 28,22; on the 8th, at 7, A. M. it had risen to 30,00, more than 1¾ inch, being 1,78 inches in 19 hours. Between the 7th and 8th of February, 1828, it rose from 28,11 to 29,62 in fifteen hours. The unsteadiness of the barometer to a remarkable extent

occurred only in the winter months. The instrument has been always carefully noted, but our trust in the results is lessened by considering that it is a wheel barometer, and consequently liable to error in proportion to the complexity of its machinery: that the neutral point is not noted, nor is there any record of the temperature of the instrument, at the times of the observations.

It is unnecessary to enter into any discussion as to the reasons why the mean annual heat is so much lower in this part of America, than countries under a similar parallel in Europe: as it is generally admitted to depend on the form of the continent, expanding as it advances to the north; and the prevalence of westerly or land winds. This applies equally to all the eastern coast within the temperate zone. But the places north of Nova Scotia have a source of cold from the sea breezes also, which does not exist to the southward. For the warm gulf stream here leaves the line of the coast, and bending eastward, crosses to the shores of Europe, where its influence is felt as high as Norway. From Mr. Scoresby's observations, it is evident that a current of cold water, bearing floating ice, sets to the southeast, from Spitzbergen to Greenland, as low as Cape Farewell, and the frequent appearance of ice-bergs in the gulf of St. Lawrence, and off the coasts of Newfoundland, prove a continuance of this current to the southward. The easterly or sea-breeze, which blows over these almost frozen waters, will have a very different temperature from that, which in the more southern latitudes, reaches the coast after crossing the gulf stream.

Captain Golownin, of the Russian Navy, in his Narrative of his Captivity in Japan in the years 1811, 12 and 13, (vol. i. p. 200) says that "the snow fell at Matsmai on the

night of the 14th of October, but it was melted by a thaw a few days afterwards. Towards the middle of November the snow fell very thick, and the winter set in." He does not say at what time in spring the ground is again clear of snow, but I infer, from a passage in his narrative, that it is about the 1st of March. Allowing eleven days for the difference of stile, the snow may be said to have remained on the ground at Matsmai from the beginning of December to the middle of March. This, in latitude 41° in a town on the sea coast, in an island, is a severity of winter beyond what is experienced in similar latitudes on the east coast of America. This difference cannot be owing to the state of cultivation, for Japan is exceedingly populous, and highly cultivated. Is the greater warmth on the east coast of America in the same parallel owing to the influence of the gulf stream?

The influence of the form of continents, and the temperature of adjacent seas, in modifying the climate of any particular place, may be shewn by comparing the account of the mean temperature at 9, A. M. at Port Famine, in the strait of Magalhaens in latitude 53°,38 S. during the six months from February to July 1828 inclusive, as given by Captain King, R. N. with that of Quebec, in lat. 46°,50 N. from August 1828, to January 1829, the months in the northern hemisphere answering to the former. On the difference of the form of the American continent in those two places it is unnecessary to remark. In speaking of the comparative warmth of the surface of the sea at Port Famine, as illustrative of the mildness of the climate, Captain King says, "I have in the month of June, the middle of the winter season, observed a difference of 30°, upon which occasion the sea was covered with a cloud of steam."

Mean temperature at 9, A. M.—Port Famine, February 51° 38, March 49° 87, April 40° 61, May 36° 36, June 31° 83, July 31° 50.

Quebec.—August 64° 30, September 56° 80, October 41° 90, November 28° 76, December 9° 87, January 6° 39.

Mean of autumnal months at Quebec 54° 33. Port Famine 47° 29. Winter months—Quebec 15° 0. Port Famine 33° 23.

Port Famine maximum during the six months 68°. Minimum 12°, 6. Range 55°, 4.

Quebec Maximum during the six months 87°. Minimum 33°. Range 120°.

The contrast will be more striking when we consider that, under similar circumstances, the southern hemisphere is admitted to be much colder than the northern.

It is a matter of some interest to enquire whether the climate of Canada has undergone any material change since the first settlement of the country; and whether we can hope for any amelioration, as clearing and cultivation extends. To the first I fear it will be difficult to obtain a precise answer, from the want of accurate records; and the second can only be correctly inferred, from what is ascertained respecting the first.

The general opinion is, that the climate of a country becomes milder, as it is cleared of forests, and cultivated. The application of this doctrine to Canada is not at all new, for I find it entered into the speculations of a writer on this country towards the end of the 17th century. It is founded on the generally admitted fact, that the climate of Europe is much milder now, than at the commencement of the Christian era.

The asperity of the climate of different parts of Europe

at this period, is inferred from the incidental allusions to it, that are found amongst the Roman writers.

But though the rest of Europe is cleared of most of the forests with which it was then covered, and its population and cultivation are immensely increased, so that the change in the climate of ancient Gaul and Germany might be referred to these causes, yet such is not the case with Italy. There population and cultivation are diminished perhaps in nearly an equal proportion. Nor could the improvements in the other parts of Europe have much influence on the climate of Italy; as it is shut out from them by the Alps to the north, and is bounded generally by the warm waters of the Mediterranean on the other sides. The countries whose relative temperature would most influence it, namely, those along the eastern shores of the gulf of Venice, Albania and Greece, have like itself fallen away sadly in population and agriculture. The explanation seems to have been generally received without a very strict examination into the facts connected with it, and kept for want of a better.

The early accounts of the climate of Canada cannot be free from the general exaggeration of travellers. Some allowance should also be made for the impressions caused by severe cold, against which the discoverers and first settlers were very indifferently guarded. I have not had an opportunity of consulting many of the early writers on Canada, but what is related in the following extracts, respecting the climate at the commencement of the 17th and 18th centuries, may be advantageously compared with what we know of it at the present day.

Champlain came here to settle in 1608, and writes in 1630 or 31. He had wheat sown on the 1st of October after his

arrival, and rye on the 15th: on the 3d there was hoar frost, and the leaves began to fall on the 15th. On the 18th of November much snow fell but only remained on the ground two days. On the 20th of February following some Indians were nearly lost in crossing the river, their canoes being crushed by the ice. He seems to think that they would have been deterred from crossing, if they had not been pressed by hunger; there was consequently no pont at any near point that year. Shortly afterwards he says, the snow remains five months on the ground, from December until towards the end of April.

On the 7th of May, 1612, he arrived at Quebec from France, learned that the winter had not been severe, and that the river had not been frozen over. At the time of his arrival, he says, that the trees began to be reclothed with leaves, and the meadows enamelled with flowers.

On the 19th of March, 1623, there was a storm of thunder, lightning and hail. This early appearance of a thunder storm would seem to be indicative of previous mild weather. In his journal for this year he gives the following general account of the climate, which I have extracted in the author's own words.

"Ayant remarqué qu il n'y a point quinze jours de differens d'une annèe à autre pour la temperature de l'hyver qui est depins le 20 de Novembre jusques en Avril, que les neiges se fondent, et Mai est le printemps. Quelquefois les neiges sont plus grandes en une année qu'en l'autre, qui sont de pied et demis, et trois, et quatre pieds au plus, au plat pays; car aux montagnes du costé du nord, elles sont de cinq a six pieds de haut.

"Le 8 de Mai les cerisiers commencerent à espanouir leur boutons, pour pousser leur feuilles dehors, en ce temps mesme, sortoient de la terre de petites fleurs, de gris de lin, et blanche, qui sont des primes veres du printemps, de ces lieux là.

" Le 9,les framboises commencerent à boutonner,et toutes les herbes à pousser hors de la terre.

" Le 10 ou 11. Le sureau monstra ses feuilles.

" Le 15. Les arbres furent boutonnez, et les cerisiers revestus de feuillage : et le froment monté à un ampan de hauteur : les framboisiers jetterent leur feuilles : le cerfeuil estoit bon là à coupper : dans les bois, l'oisselle s'y void a deux pouces de hauteur.

" Le 18. Les bouleaux jettent leurs feuilles : les autres arbres les suivent de pres : le chesne a ses boutons formèz, et les pommiers de France, que l'on y avoit transplantés, comme aussi les pruniers boutonnoient. Les cerisiers y ont la feuille assiz grande, la vigne boutonnoit et fleurissoit,l'oiselle estoit bonne à couper.

" Le cerfeuil des bois paroysoit fort grand : les violettes blanches et jaunes estoient en fleur. Le bled d'Inde se seme, le bled froment croissoit un peu plus d'un ampan de hauteur.

" La pluspart de toutes les plantes, et simples, estoient sortis de terre : il y avoit des journées en ce mois, ou il faisoit grande chaleur.

" Le 29 du dit mois les fraises commencerent à fleurir, et es chesnes à jetter leur feuilles assez grandes en esté.

" Le 30. Les fraises furent toutes en fleur, les pommiers commencerent à espanouir leur boutons, pour jetter leur feuilles : les chesnes avoient leur feuilles d'environ une pouce de long : les pruniers et cerisiers en fleur, et le bled d'Inde commençoit à lever." *

Chevalier Tonti, the companion of the Sieur la Salle, left Fort Frontenac, at the entrance of Lake Ontario, in a vessel of 40 tons, on the 18th November, 1678. From contrary winds he was a whole month in reaching St. Onnontuane, at the other extremity of the lake. He put in here as he could no longer make way against the rapidity of the stream from Niagara, but he says nothing of any impediment from ice. In 1684 he left Qnebec for the Illinois on the 1st of November, but could not proceed beyond Montreal in con-

* Voyages des Champlain. Partie seconde, p. 63 and 67.

sequence of the ice, but he was able to proceed up the river in the beginning of April.

La Hontan, in a letter dated the 8th of November, 1683, immediately on his arrival from France, says they had much difficulty in making their way up from Cape Tourment to Quebec in consequence of the floating ice. This seems strange, for we know that however early the ice may form in the river, the north channel, by which his ship came up, is generally quite free from it. In another letter dated May, 1684, he states the average depth of snow at 3 or 4 feet. He says the river is frozen over every year notwithstanding the tides, but we cannot learn whether he means that this occurs opposite Quebec, or at the narrows higher up.

Charlevoix, who wrote from Canada in 1721, in describing the climate, gives very few dates from which a comparison with its present state could be instituted. He states in round numbers, that the snow continues on the ground for six months, and attains to a depth of six feet in the woods. Influenced probably by the opinion respecting the effects of clearing and cultivation, then generally entertained by the learned, he speaks of a great amelioration having taken place in the climate within the last 24 years, but gives no reason for the assertion. There is however one fact, incidentally mentioned by him afterwards, from which an inference respecting the climate at that time may be drawn; he drank maple juice at the Indian village of St. Francois, between the 9th and 11th of March, and mentions that as the period when it was customary to tap the maple trees.

I have not been able to search deeply into the reports of the climate of Canada by the early visitors, and of the few

I examined none except Champlain gave any definite accounts. La Hontan, and Charlevoix, who both affect to treat of the climate, confine themselves to some general observations; and as these are given in letters dated within the first year after their arrival, they can be considered as little else than first impressions. Champlain's account is very particular, and would bring us to a conclusion that, if there is any change since his time, it is that the winters are a very little longer, and our spring rather later now than when he wrote. Champlain however was establishing a colony at Quebec, and he might perhaps, in his description of the climate, be influenced by a wish of making it appear as little repulsive as possible to the people of France.

The facts mentioned by Tonti would not lead us to suppose that the climate in his day was more severe than at present; neither would the assertions of La Hontan. If Charlevoix's general assertions were true, however, it would lead to a different conclusion. But the early period at which he says it was customary to tap the maple trees shows that the spring in his day was as early as at the present. What are we to think of his assertion of the climate becoming milder within the last 24 years. When from Tonti's letter and La Hontan's, written almost 40 years before, it would seem to be even milder then, than what he describes it to be.

From the little evidence we have here, of which Champlain's, from his long residence, and his entering so fully into particulars, is alone worthy of any attention, the conclusion that the climate has undergone no change, may I think be safely drawn. Indeed if we allow the truth of Champlain's account of it, and I know of no reason for calling it much in question, there can be no doubt of the mat-

ter. Little satisfactory information can be obtained from the general assertions, or the incidental circumstances noted by travellers. The first are influenced by the effect of first impressions on the individual, and the love of exaggeration so natural to the human mind, that causes it to magnify all extremes, whether of heat, or of cold, or any thing else. Men were more likely to give way to such impressions in this case, as they had no instruments for measuring the temperature. Again very little can be inferred from incidental occurrences, as there is often a considerable difference in the rigor of even two succeeding seasons. Of this few years pass without giving us proofs. In some years the snow is all gone from the streets of Quebec, and the fields in the neighbourhood, early in April; in others, it remains until after the first of May. In 1830 December was mild with frequent rains; in December 1831 the thermometer was below zero more than every second day on an average. The time at which a vessel may have arrived in spring, or sailed in the fall, in like manner conveys little satisfactory information respecting the climate generally. In 1826, a vessel sailed from Quebec on the 14th of December, and I am informed, by Mr. Thompson of the Exchange, that the river was sufficiently open for navigation for at least a fortnight longer. In 1827, the Ottawa and Kingfisher sailed from Quebec on the 23d of November, and were stopped by the ice at Crane Island. Besides the general time for vessels sailing in the fall, would probably be much earlier formerly than at present; as the vessels were much smaller, the river less known, and probably the sailors less expert. The trade, too, was small, and the cargoes, consisting chiefly of furs acquired during the preceding winter, were ready early: whilst at present from the

immense lumber, and potash trade, the freight on which generally rises very much towards the close of the season, ship masters are induced to wait as long as possible.

To conclude, it seems probable that no material change has taken place in the climate of Canada for the last 200 years at least; or if any has occurred, we have no precise means of estimating its amount. If this conclusion is correct, the inference, that we have little amelioration to expect in the future, seems to follow, however disagreeable, and contrary to our prejudices it may be to admit it. In this I only allude to the change expected to arise from clearing and cultivation; as such causes only, by being extensive in ther operation, could take their full effect in a comparatively short time. The great changes, that have made the earth, at the depth of a few feet, be now frozen all the year round, in places where formerly tree ferns, and other productions of the tropical regions grew, may again in the progress of time change the climate of North America, or of the whole globe: but as long as the continents retain their present forms, the prevailing westerly winds, depending on physical causes not liable to change, will make the climate on their eastern coasts within the temperate zone, much more severe in the winter, and unequal in the summer, than that of the western.

1824.	Barometer.			Thermometer.			Winds.			Weather.			Thunder storms and distant thunder.
	Mean at 9, A. M.	Highest.	Lowest.	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.	Days with snow.	Days with rain.	Dry days.	
				°	°	°							
January	29.22	30.16	28.03	7.76	29	—17	21	8	2	10	...	21	...
February	29.19	30.34	27.90	9.38	50	—40	16	9	4	12	1	16	...
March	29.47	30.10	28.79	22.84	59	—11	12	14	5	8	2	22	...
April	29.17	30.00	28.50	37.43	67	13	17	13	...	3	9	18	...
May	29.20	30.14	28.36	43.74	72	24	19	4	8	5	10	19	1
June	29.15	29.60	28.57	59.00	86	36	11	15	4	...	15	15	6
July	29.22	29.85	28.54	65.10	84	47	25	2	4	...	13	18	7
August	29.41	29.84	28.77	62.70	78	47	19	9	3	...	7	24	2
September	29.50	30.13	28.91	57.47	88	39	19	7	4	...	6	24	...
October	29.21	29.85	28.51	39.50	65	18	25	5	1	3	11	17	...
November	29.60	30.25	28.75	22.00	36	10	19	9	2	10	1	19	...
December	29.49	30.30	28.24	14.6	36	—12	22	7	2	11	8	17	...
Annual	29.32	30.34	27.90	36.80	88	—40	225	102	39	62	78	230	16

1825.	Barometer.			Thermometer.			Winds.			Weather.			Thunder storms, &c.
	Mean at 9, A. M.	Highest.	Lowest.	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.	Days with snow.	Days with rain.	Dry days.	
				°	°	°							
January	29.51	30.42	28.71	8.55	30	—21	18	9	4	11	1	19	...
February	29.59	30.25	28.55	10.14	30	—20	12	12	4	7	1	20	...
March	29.43	30.08	28.70	22.80	41	7	14	14	3	9	...	22	...
April	29.45	30.11	28.75	36.76	60	6	13	12	5	7	4	19	1
May	29.55	30.05	28.95	47.80	80	25	13	9	9	1	7	23	1
June	29.34	29.75	28.65	62.40	85	47	19	7	4	...	9	21	4
July	29.39	29.71	29.02	65.74	87	46	20	7	4	...	14	17	7
August	29.50	30.07	28.65	61.29	79	43	15	10	6	...	10	21	2
September	29.50	29.85	28.97	50.06	68	31	21	8	1	...	11	19	...
October	29.55	30.25	28.68	39.02	73	21	21	9	1	3	9	21	...
November	29.70	30.40	28.75	26.73	55	4	20	6	4	3	7	21	...
December	29.43	30.37	28.39	11.80	34	—28	18	11	2	14	2	16	...
Annual	29.49	30.42	28.39	36.92	87	—28	204	114	47	55	75	239	15

1826.	Barometer.			Thermometer.			Winds.			Weather.			Thunder storms.
	Mean at 9, A. M.	Highest.	Lowest.	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.	Days with snow.	Days with rain.	Dry days.	
				°	°	°							
January	29.17	30.04	27.80	10.10	37	—36	19	9	3	12	1	18	...
February	29.50	30.17	28.20	8.30	42	—42	19	8	1	11	1	16	...
March	29.57	30.52	28.70	20.90	39	— 5	15	12	4	9	4	20	...
April	29.39	30.05	28.65	31.55	52	1	19	8	3	2	4	24	...
May	29.45	29.90	28.82	52.61	86	30	14	12	6	...	13	18	3
June	29.45	29.92	28.87	62.96	91	44	18	10	2	...	11	19	2
July	29.47	29.90	29.03	67.80	95	50	21	4	6	...	14	17	15*
August	29.58	29.91	29.02	66.77	92	46	15	13	5	...	7	24	7*
September	29.56	30.10	29.00	55.43	77	37	18	9	3	...	11	19	...
October	29.49	30.21	28.80	39.53	66	22	20	6	5	1	10	20	...
November	29.36	30.18	28.43	25.96	41	11	16	10	4	6	8	17	1
December	29.39	30.02	28.35	12.19	39	—22	21	8	2	12	2	7	1
Annual	29.45	30.52	27.80	37.84	95	—42	213	109	43	53	86	229	27

1827.	Barometer.			Thermometer.			Winds.			Weather.			Thunder storms.
	Mean at 9, A. M.	Highest.	Lowest.	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.	Days with snow.	Days with rain.	Dry Days.	
				°	°	°							
January	29.45	30.10	27.61	7.90	33	18.5	15	11	5	8	1	23	...
February	29.29	30.10	28.25	10.90	41	—29	16	5	7	13	2	13	...
March	29.38	30.19	28.29	23.80	51	— 7	16	7	8	8	3	21	...
April	29.26	30.06	28.55	36.07	58	16	15	12	3	4	12	14	1
May	29.34	29.96	28.86	50.32	82	31	9	17	5	1	8	22	1
June	29.42	29.85	28.62	60.13	90	37	16	10	4	...	15	15	5
July	29.49	29.83	29.00	64.66	92	49	16	11	4	...	10	21	4
August	29.54	30 03	29.00	61.68	83	40	21	5	5	...	10	21	2
September	29.61	30.20	28.97	53.66	77	40	15	13	2	...	12	18	1
October	29.34	29.90	28.28	42.16	66	21	17	9	5	5	9	17	...
November	29.18	30.30	28.10	20.20	41	3	24	4	2	8	2	20	...
December	29.62	30.50	28.47	8.77	35	—16	22	6	3	12	1	18	...
Annual	29.41	30.50	27.61	36.69	92	—29	202	110	53	59	85	223	14

* Thunder often distant, and unaccompanied by rain.

1828.	Barometer.			Thermometer.			Winds.			Weather.			Thunder storms.	Aurora Borealis.
	Mean at 9, A. M.	Highest.	Lowest.	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.	Days with snow.	Days with rain.	Dry days.		
January	29.51	30.35	28.37	8.21	37	—24	19	9	3	10	3	18	...	1
February	29.22	30.37	28.09	15.32	41	—18	18	8	3	9	2	18	...	...
March	29.63	30.30	28.84	22.74	51	—14	18	11	2	7	2	22	...	1
April	29.47	29.98	28.80	31.90	57	— 1	15	14	1	5	6	21	...	5
May	29.37	30.08	28.34	50.03	76	27	17	14	...	...	12	19	2	...
June	29.45	29.94	28.65	62.66	90	46	13	15	2	...	15	15	9	...
July	29.23	29.59	28.85	62.35	81	49	16	12	3	...	19	12	7	2
August	29.47	29.95	28.82	64.30	87	45	17	7	7	...	15	16	10	3
September	29.57	30.04	28.82	56.80	74	37	19	7	4	...	11	19	3	2
October	29.46	30.10	28.45	41.90	63	21	23	5	3	2	9	20	1	2
November	29.37	30.20	28.30	28.76	54	6	18	8	4	8	6	16	...	...
December	29.39	30.13	28.35	9.87	34	—24	21	7	3	16	...	15	...	3
Annual	29.44	30.37	28.09	37.90	90	—24	214	117	35	57	100	211	32	19

1829.	Barometer.			Thermometer.			Winds.			Weather.			Thun. storms and dis. thun.	Aurora Borealis.
	Mean at 9, A. M.	Highest.	Lowest.	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.	Days with snow.	Days with rain.	Dry days.		
January	29.48	30.20	28.72	6.39	38	—33	18	11	2	17	1	13	...	2
Fbruar	29.12	29.77	28.18	8.22	32	—16	20	5	3	6	...	22	...	...
March	29.22	29.71	28.30	20.84	48	— 8	22	8	1	8	4	19	...	1
April	29.24	29.80	28.60	38.03	60	22	12	14	4	4	8	18	1	2
May	29.45	30.06	28.35	53.84	91	34	14	12	5	1	11	20	3	3
June	29.27	30.15	28.61	62.63	88	43	17	6	7	...	10	20	7	4
July	29.37	29.95	28.51	62.97	81	47	24	7	...	...	15	16	7	3
August	29.45	29.74	28.85	62.39	85	42	22	3	6	...	11	20	7	1
September	29.34	29.95	28.70	49.30	73	27	23	3	4	1	15	14	1	1
October	29.65	30.40	28.69	42.90	66	22	20	10	1	2	10	19	...	5
November	29.27	30.10	28.15	27.20	40	2	17	10	3	6	11	14	...	...
December	29.62	30.63	28.06	18.95	37	— 9	17	9	5	8	3	20	...	6
Annual	29.37	30.63	28.06	37.81	91	—36	226	98	41	53	99	215	26	28

1830.	Barometer.			Thermometer.			Winds.			Weather			Thunder storms, and distant thunder.	Aurora Borealis.
	Mean at 9, A. M.	Highest.	Lowest.	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.	Days with snow.	Days with rain.	Dry Days.		
January	29.32	30.30	28.54	1.36	31	—33	19	9	3	13	...	18	...	4
February	29.36	30.32	28.29	7.86	37	—25	18	4	6	6	...	22	...	7
March	29.41	30.12	28.00	23.48	44	— 8	15	12	4	10	4	17	...	6
April	29.71	30.15	28.85	41.33	70	24	10	17	3	2	5	23	2	9
May	29.39	29.95	28.83	51.10	81	29	19	8	4	1	12	18	4	7
June	29.25	29.74	28.50	58.00	79	42	12	14	4	...	17	13	5	3
July	29.45	29.83	29.07	65.80	94	50	12	17	2	...	9	22	9	3
August	29.43	29.81	28.90	62.52	82	44	19	10	2	...	12	19	7	10
September	29.56	30.03	28.72	50.97	67	31	17	8	5	...	14	16	...	7
October	29.54	30.15	28.70	42.42	65	27	19	8	4	...	8	23	3	9
November	29.68	30.25	28.95	34.37	55	18	7	21	2	3	5	22	...	2
December	29.24	30.11	28.00	19.70	46	—13	18	12	1	15	5	11	...	4
Annual	29.44	30.32	28.00	38.24	94	—33	185	140	40	50	91	224	30	71

1831.	Thermometer.			Winds.			Weather.			Thunder storms, and distant thunder.	Aurora Borealis.
	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.	Days with snow.	Days with rain	Dry days.		
	°	°	°								
January	3.94	32	—22	26	4	1	10	...	21	...	6
February	12.40	39	—16	21	5	2	9	1	19	...	2
March	27.36	44	— 4	14	16	1	10	3	19	...	7
April	35.90	55	12	12	17	1	7	11	12	...	4
May	52.00	86	29	15	14	2	1	16	14	4	6
June	66.46	87	44	15	12	3	...	13	17	6	1
July	68.60	92	33	25	6	...	...	11	20	8	4
August	65.40	88	34	22	7	2	..	11	20	6	1
September	54.30	53	30	20	9	1	1	15	14	3	2
October	41.55	65	27	15	14	2	2	17	13	...	1
November	32.13	44	11	20	9	1	7	8	16	...	1
December	1.13	24	—23	26	5	...	9	...	22	...	...
Annual	38.43	92	—23	231	118	16	56	106	207	27	35

MEAN OF EIGHT YEARS' OBSERVATIONS AT QUEBEC,

FROM 1824 TO 1831.

	Barometer. Mean of 7 years.			Thermometer.			Winds.			Weather.				
	Mean at 9, A. M.	Highest.	Lowest.	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.	Days with snow.	Days with rain.	Dry days.	Thunder, &c. Mean of 5 years.	Aur. Bor. Mean of 4 years.
				°	°	°								
January.....	29.38	30.42	27.61	6.78	38	—36	19	9	3	11	1	19	... ...	3
February....	29.34	30.37	27.90	10.32	50	—42	17	7	4	9	1	18	... ...	2
March.....	29.44	30.52	28.00	23.10	59	—14	16	12	3	8	3	20	... ...	4
April.....	29.38	30.15	28.50	36.12	70	— 1	14	13	3	4	7	19	0.63	5
May.....	29.39	30.14	28.34	50.18	91	24	15	11	5	1	11	19	2.50	4
June.....	29.33	30.15	28.50	61.78	91	36	15	11	4	.....	13	17	5.50	2
July.....	29.37	29.95	28.51	65.38	95	33	20	8	3	.....	13	18	8	3
August.....	29.48	30.07	28.65	63.38	92	34	19	8	4	.....	10	21	5	4
September..	29.52	30.20	28.70	53.50	88	27	19	8	3	0.25	12	18	1	3
October.....	29.46	30.40	28.28	41.12	73	18	20	9	2	2	10	19	0.50	4
November...	29.45	30.40	28.10	27.17	55	2	18	10	2	6	6	18	0.125	1
December...	29.45	30.63	28.00	12.13	46	—28	21	8	2	12	2	17	0.125	3
Annual.....	29.42	30.63	27.61	37.58	95	—42	213	114	38	53	89	223	23.5	38

Dew point of the Air at Quebec, and in different places of the River and Gulf, in the years 1829 *and* 1831.

1829.	Time of Observ.	Temp. of Air.	Dew Point.	1831.	Time of Observ.	Temp. of Air.	Dew Point.	Remarks.
		°	°					
April.....	2, P.M.	43.8	31.0	River and Gulf. Quebec	9, A.M.	38.7	29.5	In 1829 the observations were made at Quebec during the months of April, May and June; in different places of the river and gulf in July, August, September, and the first half of October; the remainder of the year at Quebec.
May.....	10, A.M.	63.0	44.6		.....	53.8	46.0	
June.....	.....	67.8	51.0		.....	55.3	49.3	
July	9, A.M.	59.5	54.0		.....	58.0	52.6	
August ...	.....	57.2	51.5		.....	59.7	51.0	
Sept.....	.....	49.0	42.5		.....	53.0	48.0	
October..	.....	45.8	37.7					
Nov.....	10, A.M.	31.2	25.6					
Dec.....	.....	23.1	17.0					

A Comparison of the mean temperature at 9, *A. M. in the years* 1830 *and* 1831, *with the mean of eight daily observations (six real and two supposed) for the same period.*

	1830.		1831.	
	Mean at 9, A. M.	Mean of 8 observ.	Mean at 9, A. M.	Mean of 8 observ.
	°	°	°	
January.....	1.36	2.27	3.94	5.31
February.....	7.86	9.09	12.40	12.80
March.....	23.48	23.04	27.36	26.56
April.....	41.33	40.95	35.90	34.64
May	51.10	49.56	52.00	51.86
June.....	58.00	56.97	66.46	63.80
July	65.80	65.57	68.60	67.70
August..	62.52	61.92	65.40	65.20
September.....	50.97	51.25	54.30	52.83
October.....	42.42	42.08	41.55	41.23
November.....	34.37	34.53	32.13	31.91
December.....	19.70	20.09	1.13	2.73
Annual.....	38.24	38.11	38.43	38.05

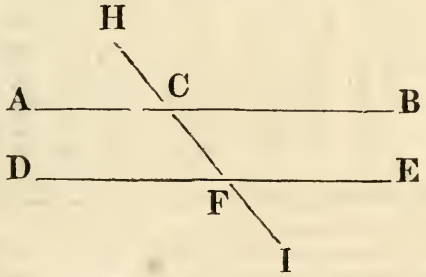
ART. III.—THE THEORY OF PARALLEL LINES, BEING AN ATTEMPT TO DEMONSTRATE THE TWELFTH AXIOM OF EUCLID. BY THE REV. D. WILKIE.

READ BEFORE THE SOCIETY ON THE 21ST JAN., 1832.

In the following paper, the truth of the first eleven axioms, and of the first twenty-six propositions of the first book of Euclid, and of these only, is to be admitted.

DEFINITIONS.—I. When a line cuts two other lines, the angles on the opposite sides of the cutting line, and at its opposite extremities, are called ALTERNATE angles.

II. When a line cuts two other lines, making the alternate angles equal, these two lines are said to be PARALLEL.



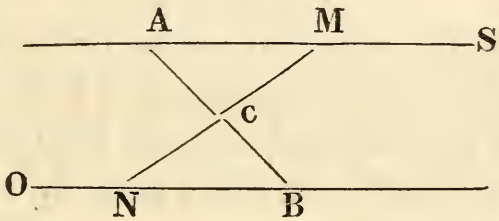
Thus, if the line HI cut the two lines AB, DE, the angles ACF and CFE are called alternate; and also BCF and CFD.

THEOREM 1.—*If a line cut two other lines, making one pair of the alternate angles equal, the remaining pair shall also be equal.*

Thus, if the angle ACF be equal to CFE, the remaining pair of alternate angles, BCF and CFD, shall also be equal.

For, the angles ACF, BCF, being equal to two right angles (XIII. 1. Eucl.), and CFD, CFE, being also equal to two right angles; the two ACF, BCF, are equal to CFD, CFE (Ax. 1.). And since ACF is equal to CFE, the remainder BCF is equal to the remainder CFD.—Q. E. D.

THEOREM 2.—*If a line cut two parallel lines, any line bisecting the line which cuts them will have its alternate angles equal.*



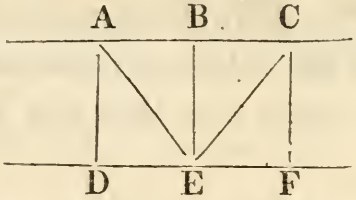
Let AM be parallel to NB, in consequence of the line AB cutting them, and having its alternate angles equal; any line, as NM, bisecting AB in C, and meeting the parallel lines, shall have its alternate angles also equal.

For, the angle MAC being equal to CBN by supposition, and the opposite angles ACM, BCN also equal (XV.1.Eucl.) and likewise the side AC equal to CB by construction, the two triangles are entirely equal (XXVI.1. Eucl.). Hence, the angle AMC is equal to the angle CNB, and they are alternate angles. Hence, also, the angle MNO is equal to NMS. Wherefore, any line bisecting AB, and meeting the parallel lines, makes its alternate angles equal, as was to be shown.

COR.—Hence, a line passing through the point C, and perpendicular to the one line, is perpendicular to both*.

* This was first proved by Dr. R. Simson; but his proposition is limited to lines bisecting the cutting line, and falling on the parallels at right angles, as in the Cor.

THEOREM 3.—*The perpendiculars to one of two parallel lines, drawn from points in the other, which are at equal distances from the line which is perpendicular to both, are equal to one another.*



Let AC and DE be parallel, and let BE be the line which (by Cor. Prop. 2.) is perpendicular to both; and let the points A and C, be at equal distances from B, the perpendiculars let fall from these points upon the other parallel, are equal to one another.

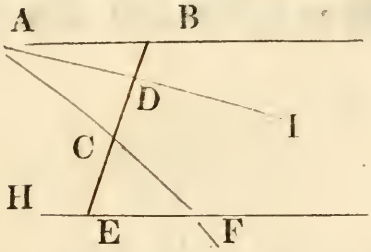
For, if AE and EC be drawn, the triangles ABE, CBE having AB equal to CB by supposition, BE common, and the angle ABE equal CBE being both right angles; are entirely equal. (Eucl. I. 4.) Consequently the line AE equal to CE and the angle BEA equal to BEC.

Also, let AD be perpendicular to DF, and having made EF equal to ED, join CF. Then, the whole angle BEF being equal to the whole BED, and the part BEC equal to the part BEA, the remainder CEF is equal to the remainder AED.

Hence, the triangles AED, CEF having the two sides and the angle between them in the one, equal to the two sides and the angle between them in the other, are entirely equal, (by the IV. of the first.) Therefore the angle at F is equal to the angle at D, which is a right angle, and CF equal to AD.

Wherefore AD and CF, which are perpendicular to DF, and drawn from the points A and C at equal distances from the point B, are equal to one another.—Q. E. D.

THEOREM 4.—*If a line cut two lines, making the alternate angles unequal, every line bisecting that line, and meeting the other two, shall make unequal angles with these two.*



Thus, if the line AF cut the two lines AI, HF, making the alternate angles AFH, FAI, unequal, every line bisecting AF, and meeting AI, and HF shall have its alternate angles unequal.

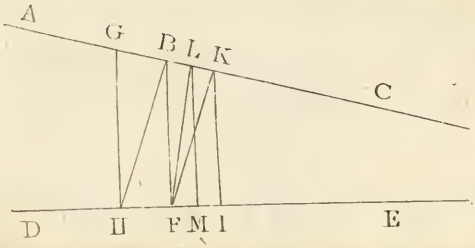
For, since the angle FAI is unequal to AFE, let FAB be equal to AFE, that is let AB be parallel to HF, then, let AF be bisected in C, and through it, draw ECB, cutting the two parallels in B and E: the angle ABC is equal to CEF (by the 2d of this paper.) But the angle CDA is greater than the interior opposite one CBA, (Eucl. I. 16.) and consequently greater than CEF. That is, the alternate angles are unequal. In the same manner, any line bisecting AF and meeting the lines AI and HF may be shown to have its alternate angles unequal.—Q. E. D.

COR.—Hence it is manifest that the line bisecting AF and drawn perpendicular to HF, will make unequal angles with AI. That is,

If a line cut two lines, making the alternate angles unequal, the line which bisects that line and is perpendicular to one of the two lines, makes oblique angles with the other.

THEOREM 5.—*If a line cut two other lines, making the alternate angles unequal, the lines drawn from the one line*

perpendicular to the other, will continually decrease, the nearer to the acute angle being always greater than the more remote: on the other hand, these perpendiculars will continually increase on the side of the obtuse angle, the nearer being always less than the one more remote.



Thus, if BF cut the two lines AC, DE, and make unequal angles with them, so that BFD may be a right angle, while FBC is acute (by the 4th of this paper,) then, if from any other points L and K in the line AC, perpendiculars be let fall upon DE at M and I, LM shall be less than BF, and KI less than LM. Also, BF is less than GH, and GH less than any perpendicular beyond it.

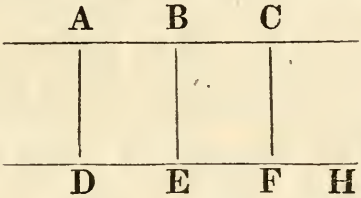
For, supposing FK to be perpendicular to AC, then, in the triangle FBK, right-angled at K, the side BF is greater than FK (Eucl. I. 19.) For the same reason, in the triangle FKI, right-angled at I, the side FK is greater than KI. Much more, then, BF which was proved to be greater than FK, is greater than KI.

Further, let L be any point between B and K, then, upon drawing LM perpendicular to DE, the triangle BFL must have the angle BLF obtuse because greater (by Eucl. I. 16.) than the inward opposite angle FKL which is right. Therefore, in the triangle BFL, the side BF, opposite to the obtuse angle BLF, is greater than the side FL opposite to the acute angle FBL (Eucl. I. 19.) For the same reason, in the triangle FLM, the side FL opposite the right-

angle FML, is greater than LM, opposite to the acute angle LFM, which is acute because only a part of the right-angle BFM. Much more must the line BF, which was proved to be greater than FL, be greater than LM. For the like reasons, LM is greater than MK, and MK greater than KI. Much more, then, is LM greater than KI.

Thus, it appears, that perpendiculars to DE, drawn from points in the line AC, continually decrease as these points recede from the acute angle at B. And in the same manner, it may be proved that perpendiculars to DE, drawn from points in the AC, continually increase as these points recede from the obtuse angle at B, as asserted.*

THEOREM 6.—*Every line which is perpendicular to one of two parallel lines, is perpendicular to the other.*



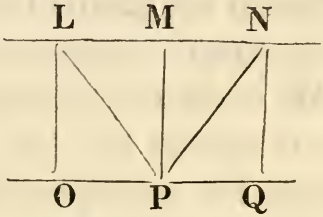
Let the lines AC, DF be parallel, having BE perpendicular to both (by the Cor. to our 2d;) any other line perpendicular to the one shall be perpendicular to the other.

For, if BA be taken equal to BC, and AD, CF be both drawn perpendicular to DF, these perpendiculars shall be equal (by the 3d of this paper.) But if CF had its alternate angles unequal, no other perpendicular as AD, drawn from AC to DF, could be equal to CF. Therefore since AD is equal to CF, the angle BCF is equal to CFH, which is a

*NOTE.—This is the most important part of the theory, now attempted, as all the rest of the demonstrations succeeding depend upon it. It implies, that, if two lines are not parallel, according to the definition given above, no two perpendiculars drawn from the one upon the other, can be found equal.

right angle. Hence, FC is perpendicular to AC. And, in the same manner, any other perpendicular to DF may be shown to be so to AC.

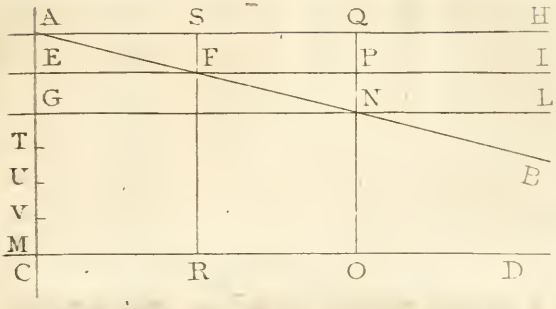
THEOREM 7.—*Parallel lines are every where at the same perpendicular distance.*



Let LM and OQ be parallel, or have the alternate angles formed by some line cutting these equal, any perpendiculars to them, as LO, NQ shall be equal.

For, bisect LN in M (Eucl. I. 10.) and join LP and PN. Also, let PM be perpendicular to LM, and it will be so to OQ, (6.) Then, the triangles LMP, MNP are entirely equal, (Eucl. I. 4.) and have the side LP equal to NP and the angles PLM, LPM, respectively equal to MNP, MPN. Now since the whole MLO is equal to MNQ (6.) and the part MLP equal to MNP, the remainder OLP is equal to the remainder QNP. In like manner the angle LPO is equal to the angle NPQ. Wherefore the triangles OLP and QNP, having two angles equal, and the side LP equal to PN Eucl. I. 26.) are entirely equal. Hence the side LO is equal to the side NQ, and thus all the perpendiculars cutting the two lines, may be shown to be equal.

THEOREM 8.—*If a line cut two other lines, making the alternate angles unequal, the two lines will meet, if produced, on the side of the acute angle.*



Let AC cut the two lines AB, CD, making the alternate angles unequal to each other, the lines AB, CD will meet, if produced, on the side on which one angle is acute, or less than the adjacent. For example, let AC be perpendicular to CD, and have the angle CAB, alternate to ACM, acute, AB and CD will meet, if produced, towards B and D.

To prove this, take AF, FN, equal distances on the line AB, and through the point F, draw EFP parallel to CD; then EP is perpendicular to AC, (6.) and the angles AEF and FEC are right angles. Through A and N, draw AH and LNG, both parallel to CD. Then, draw NQ parallel to AC, that is (Def. 2.) make the angle ANQ equal to the angle FAE (Eucl. I. 23.)

Hence, the triangles FAE, FNP, having the angle NFP equal to the angle AFE, (Eucl. I. 15.) and the angle FAE equal to the alternate angle FNP, (by Hyp.) also the side AF equal to the FN, (also by Hyp.) are entirely equal (Eucl. I. 26.) Wherefore the side AE is to the side PN.

But the lines PN and EG being perpendicular to the two parallel lines GL and EI, are equal, (7.) Hence GE is equal to EA, and EA is also equal to FS, (7.) also, RF is equal to CE, and ON equal to CG, (7.)

It thus manifestly appears, that AC, FR, NO, the perpendiculars let fall from AB upon CD, at the equidistant

x equal

points, A, F, N, decrease by the equal differences, AE, EG. In the same manner, if more points be taken on AB, at distances each equal to AF, the perpendiculars let fall from these points upon CD, will decrease by differences each equal to AE.—By taking AE, therefore, a sufficient number of times, it must at last, either end at C, or beyond it at X. But, by taking AF the same number of times upon AB, it must at last end in the line CD, or on the other side, since it has been just shown, that every line joining the corresponding points in AC, and AB, is perpendicular to AC, and therefore parallel to CD. If, for example, four times AE should be found equal to AC, four times AF must end precisely in some point of the line CD, (Eucl. I. 11. Cor.) ; but if AC should be found to be more than four times, but less than five times AE, then, four times AF would not meet CD produced, but five times would pass it. Hence AB and CD, being both produced, must meet, and it is on the side of the acute angle, that they meet.

QUEBEC, December 27th, 1831.

In the preceding paper, I have endeavored to remove the defect under which the science of Geometry has hitherto laboured from the imperfect elucidation of parallel lines. To this attempt I alluded in my paper on "Space and Length," inserted in the second volume of the transactions of this society.

I have not had the pleasure of seeing the methods proposed by Legendre to remedy this defect. According to Professor Playfair, one of his methods is founded on the abstract doctrine of Functions, and therefore unsuitable to

be proposed to such as are entering on the study of Geometry. The other method is also stated by the same Professor to be of too abstruse, extensive and intricate a nature to form part of an elementary system of that science. An ingenious demonstration of this property of Parallel lines, was published in the Philosophical Magazine for 1822, by Mr. Ivory; but it is also very complicated. As far as I can judge, the preceding Theory is sufficiently simple to be put into the hands of the youngest students of Geometry. The 5th proposition and the last might be rendered more easy of comprehension by dividing each of them into two, a distribution of which they will readily admit.

In communicating this Theory I beg further to state, that it forms part of a system of Geometry which occupied my leisure hours for several years, and which is now nearly completed. Of that system, the fragment now presented, may be considered as a fair specimen, except as far as it was necessary to omit all reference to the larger work, in an extract requiring to be read independently by the lovers of demonstrative science. The extract has only been so far altered as to render it susceptible of separate perusal.

This system of Geometry, on which I have bestowed a good deal of attention, possesses the following peculiarities, which, of course, I consider as so many advantages.

1. The usual treatises on this subject, presuppose the use of the ruler and compass. That which I speak of, presupposes only the use of the ruler. The properties and use of the compass are in it derived from first principles, by the same synthetical reasoning, upon which the whole science depends.

2. The definitions, on which it is well known that this science is entirely built, are all strictly logical. The terms

which cannot be logically defined, are explained, and the principles they involve, assumed on their proper grounds.

3. No definition is attempted, till the property which it involves is shown to be possible, or assumed to be so.

4. All the propositions are simple. It is at no time attempted to prove two or more properties of a geometrical figure in the same demonstration. But where a series of truths are intimately connected so as to require a connected view to be given of them, such a view is given of them in scholia or notes appended to the propositions.

There are other minor points of difference which need not be here enumerated. The object has been, to combine the strictest geometrical reasoning with the most lucid illustration of which the subject admits. Particular care has been taken to render the introductory demonstrations as simple and easy as possible. When a habit of geometrical reasoning has once been formed, greater conciseness of expression, and more difficult forms of ratiocination, may be safely admitted.

ART. IV.—NOTES ON SOME OF THE PLANTS OF LOWER CANADA, BY WILLIAM SHEPPARD, OF WOODFIELD.

READ FEBRUARY 2, AND MARCH 30, 1830.

Order—ULMACEÆ.

GENUS—ULMUS L.

Ulmus Americana. L. White or Rock Elm. Orme blanc.

"Branches smooth; leaves oblique at the base, serratures accuminate, a little hooked; flowers pedicelled; fruit fringed with thick down."

The Common or White Elm is a stately tree, growing most frequently in rich alluvial valleys and on the margins of rivers, attaining in such situations great bulk and height, and assuming a very elegant appearance; its long slender branches hanging down in the manner of the weeping willow, gracefully disposed into ostrich feather-like shapes: it is generally admitted to stand at the head of all our trees, as the most ornamental and picturesque, and as such, deserving to be more generally preserved and cultivated in kept grounds and park scenery. The timber of this tree, when growing in rich bottoms, is not esteemed, except for purposes requiring it to be continually under water; in such situations it is remarkably durable. The wood is of a light brown colour, with an open grain resembling that of ash, and in the cross section at the but generally shews a dark coloured ring of five or six inches in diameter. It is known in market by the name of Swamp Elm. But the timber of upland elm is of a different and of a very superior quality,

being hard, white, and close grained. This is much used here for different purposes of ship-building, particularly for keel pieces and lower plank; large quantities are also yearly exported to Great Britain, where it is in request, principally for piles to drive into deep water, for wharves, piers and bridges; it is well adapted to such purposes, being straight, in long lengths, equally stout throughout, and very durable under water. In the forest, the elm is known frequently to rise with a single straight stem to a height of sixty feet, before shewing a branch. The timber of this variety, (if indeed it be not a distinct species) is known by the name of Rock Elm.

Ulmus fulva, Mich. *Slippery Elm.* Orme gras.

"Branches scabrous, whitish; leaves ovate oblong acuminate, nearly equal at base, unequally serrate, pubescent both sides, very rough; buds tomentose, with very thick yellow wool; flowers sessile."

This is also a tall handsome tree, growing both in dry situations and in alluvial soils. The timber is reddish in colour, and of a quality even superior to that of the white elm, but is less commonly brought to market. The inner bark is sometimes made into ropes for domestic purposes, like the bark of basswood; it also has mucilaginous qualities, being sometimes used for cataplasms for the healing of wounds and sores. This tree is thinly scattered throughout the country, having observed it on the Ottawa, about Lake St. Peter and other parts.

In the Notes on Canadian Plants, in the second volume of the Transactions, the genus Celtis, or Nettle tree, was noticed among the Carylideæ of S. F. Gray. It is now placed by Lindley in the order of Ulmaceæ; following the elms, therefore, would be its proper place, according to the most recent arrangement

URTICEÆ.

HUMULUS. L.

Humulus Lupulus. L. Hop. Houblon.

The hop is a well known herbaceous perennial plant, twining round whatever may be near it, and attaining a height of twelve feet or more. The seed-vessels are narcotic, and contain a strengthening bitter principle; on account of the latter quality they enter largely into the composition of beer. The young shoots in May are sometimes brought to table like asparagus. This plant prefers alluvial soils, and the moist borders of lakes and streams; it has been observed at Lake Pitt, near Craig's Road.

URTICA. L.

Urtica Canadensis. L. Canadian Nettle. Ortie.

"Leaves alternate, heart-ovate, acuminate, serrate, hispid both sides; panicle axillary, mostly in pairs, spread branched; the lower staminate ones longer than the petioles, upper pistillate ones elongated; stem covered with stings."

The Canadian nettle grows to a height of from four to nine feet, generally in alluvial soils, and on the shores of rivers subject to inundation. The public attention was much excited some years ago, respecting the textile qualities of a variety of this plant; or, according to Dr. Muhlenburg, of a distinct species, which he named Urtica whitlowi. The stalks of this nettle are susceptible of being divided like flax into a fine fibre, possessing much strength. If the plant admit of cultivation, it may hereafter become of some consequence. Grows at the outlet of the Etchemin, and abundantly on the low shores of Lake St. Peter.

Urtica Pumila. W. Stingless Nettle.

"Leaves opposite, ovate, acuminate, three nerved, serrate; lower petioles as long as the leaves; flowers monœcious, triandrous; in corymbed heads, shorter than the petioles."

An annual plant. The stem is smooth and shining, and when much shaded is pellucid. This plant varies much in size. Grows in shady woods, on the borders of the Ottawa.

Urtica Dioica. L. Common Nettle.

"Leaves opposite, cordate, lanceovate, coarsely serrate; flowers diœcious; spikes panicled, glomerate in pairs, longer than the petioles."

A stinging perennial plant about two feet high, common to Europe as well as this continent. It is of no interest here. Grows usually in dry spots by road sides; found it in such situation at Château Richer.

Urtica Procera. W.

"Leaves opposite, cordate, lanceovate, serrate; petioles ciliate; flowers diœcious; spikes somewhat branched, glomerate in pairs, equalling the petiole."

This is also a perennial, and resembles the preceding one in its young state. Collected at Anticosti by Pursh.

Urtica Divaricata. W.

"Leaves alternate, ovate, acuminate, smoothish, petioles long ciliated; panicles axillary, solitary, widely and much branched, longer than the petioles; stem stinging."

A perennial plant, somewhat resembling the *canadensis*: grows in shady woods.

CANABIS. L.

Canabis Sativa. L. Hemp. Chanvre.

This well known annual plant, native of the old continent,

has become completely naturalized in this. I will make no trite observations on the importance of this very useful plant to the empire; but it may not be improper to remark in this place, that nearly all the plants composing this natural order, possess textile qualities in greater or less degree.

MORUS. L.

Morus Rubra. L. Red Mulberry. Mûrier Rouge.

"Leaves cordate, ovate, acuminate, or three lobed, equally serrated, scabrous, soft hairs beneath; pistillate spikes cylindric."

A large and handsome tree, native of Upper Canada. The timber is said to be useful and durable; the fruit eatable. Dr. Lyons informs me that in Upper Canada, silkworms have been successfully fed with the leaves of this species of mulberry; the *alba* and *nigra* being preferred for that purpose in Europe and Asia. I have been told of the mulberry having formerly been cultivated at Montreal by the Franciscans; probably this species.

ELÆAGNEÆ.

SHEPHERDIA. NUTT.

Shepherdia Canadensis. Nutt. *Sea Buckthorn.* Argousier.

"Leaves ovate, acutish, a little glabrous above, silver haired and brilliant beneath; scales scattered, ferruginous."

A spreading deciduous shrub, six or eight feet high, and of an uncommon appearance. The flowers are small and expand before the leaves; berries red and small; leaves light green, sprinkled beneath with brown spots; grows on the rocky shores and banks of the St. Lawrence, from Quebec downwards.

ELÆAGNUS. L.

Elæagnus? Argentea. Nutt. *Silver Oleaster.*

"Unarmed; leaves oblong-ovate, sharp both ends, silver scaly; flowers nearly solitary nodding."

A spreading shrub about three or four feet high, of very unusual appearance. The leaves are of a shining silvery white both sides; the upper surface rather darker; the under side having a few scattered thin small brown scales; and the young branches covered with them. In New Holland the trees and shrubs are generally of this silvery hue, whereas here, this is the only woody plant hitherto found of that beautiful tint. I have not yet been so successful as to find the fruit of this plant, so as to be able to place it with certainty in this genus; it possibly may be a species of *Hippophae*, or of the preceding genus. Found several years ago, in one solitary spot, on the rocky shore of the Island of Orleans.

THYMELÆX.

DIRCA. L.

Dirca Palustris. L. Leatherwood. Moosewood. Bois de pelon.

A deciduous shrub of four or five feet in height, with light gray bark; and leaves oval, entire, alternate, on long footstalks. Flowers yellow, appearing early in May before the leaves expand; fruit a small yellow berry. The whole plant is remarkably pliable, and the bark so strong and flexible as to be frequently used for ligatures, and for straps to carry burdens; it is easily stripped off the plant its whole length when required for use; whence probably the name of *Bois de pelon*, usually pronounced *Bois de plomb*. It is

said that a decoction of this bark has been used with success in intermittant fevers. Grows in moist hardwood lands throughout the Province, and its presence is admitted to be an indication of a rich deep soil. Found near the Falls of the Chaudiere.

OLEINÆ.

FRAXINUS. L.

Fraxinus acuminata. Lam. *White Ash.* Fréne blanc.

"Leaflets petioled, oblong, shining, acuminate, very entire, glaucus beneath; flowers calycled."

A tall upright tree, with compact head; stem straight and covered with light grey bark, divided by deep furrows into small prominent squares. The timber is whitish, straight grained but rather porous, yet strong and elastic, rendering it very fit for boat oars, and for the purposes of the carriage-maker; it is the most valuable kind of ash that we possess. Large quantities of this timber, in square logs, are annually brought to this market, and shipped to Britain and Ireland. The inner bark is possessed of astringent properties. Grows on the banks of rivers, and other situations throughout the country.

Fraxinus juglandifolia. W. Swamp Ash.

"Leaflets petioled, ovate, serrate, glaucus beneath, axils of the leaves pubescent; branchlets glaucus; flowers calycled."

This species of ash attains as great a height as the preceding one; but the timber is not held in any estimation, not being applied to any useful purpose, except for hoops in the young state; the ashes, however, are rich in alkali. Common in swamps and places liable to inundation.

Fraxinus pubescens. W. Red Ash.

"Leaflets petioled, oval-ovate, serrate; petioles and branchlets downy beneath; flowers calyceled."

A tree of smaller growth than the preceding ones. The timber is of a reddish colour and of good quality, not inferior to the White Ash. Grows in similar situations with it.

Fraxinus sambucifolia. W. Black Ash.

"Leaflets sessile, lance-ovate, serrate, rugose shining, round-oblique at the base; axils of the veins villose beneath; flowers not calyceled."

A large tree generally found growing in swampy and inundated lands. The timber is not much used, except for hoops and for basket-making; the annual layers of wood being susceptible of separation, our Indian women avail themselves of this property to construct baskets of all sizes for sale; a profitable source of industry to them. The ashes of this species also abound in alkali; the wood is in consequence sought for by the pot ash manufacturer for burning and lixiviating its ashes.

ERICEÆ.

All the Canadian plants of this natural order are small, but very pretty and ornamental shrubs; the greater part of them evergreens.

ANDROMEDA. L.

Andromeda polyfolia. W. Marsh Andromeda. Wild Rosemary.

"Leaves linear lanceolate, convex, revolute, grey and hoary beneath, glaucus above; flowers aggregate, terminal; carol subglobose; anthers bearded towards the tip."

A small evergreen shrub, six inches to a foot in height, with narrow stiff leaves of a bluish colour; flowers small, globular, in clusters at the ends of the branches, white tinged with red; very pretty. This is an ornamental little shrub, of easy culture in a peat earth border. Grows in sphagnous swamps, at Sillery and other parts.

Andromeda calyculata. L. Box leaved Andromeda.

"Leaves lance-oblong, serrulate, subrevolute, with scaly dots, rust coloured beneath; racemes terminal, leafy, turned one way; pedicels short, solitary, axillary; calyx acute, two bracted at the base, bracts broad ovate, acuminate; cord oblong cylindrical."

An evergreen shrub about two feet high, with small leathery leaves. Flowers white, hanging in a row at the ends of the young branches. This is also an ornamental plant, deserving a place in the shrubbery. It grows in company of the preceding one, and much more abundantly.

Andromeda hypnoides. W. and *tetragona.* W. are supposed to be natives of Canada; the former having been found by Mr. Blair in the high mountains of the adjoining State of Vermont; and the other by Colmaster in Labrador.

ARBUTUS. L.

Arbutus uva ursi. L. Bearberry. Saccacommi.

"Stem procumbent; leaves wedge obovate, entire; berry five sided."

A trailing evergreen shrub, spreading close to the ground. Berries small red; leaves resembling those of the box plant. These are frequently used to smoke in lieu of tobacco, by the traders' *engagés* in the fur countries, in the occurrence of a scarcity of that (to them) almost necessary article of life. This plant has the reputation of possessing some

medicinal qualities. Grows on the sides of dry hills, forming large patches of a beautiful close green carpet; localities at Spencerwood, and about a mile beyond, on the steep bank of the St. Lawrence.

PYROLA. L.

Pyrola rotundifolia. L. Round leaved Pyrola.

"Leaves round, or round obovate, serrulate; spike, with the flowers reversed; pistil declined; stigma declined, with five turbercles."

A low evergreen plant, scarcely shrubby, with thick leathery leaves, one and a half to two inches in diameter; and bearing an upright spike of handsome, pink, odorous flowers. Grows very abundantly in the dry pine woods about Quebec and elsewhere.

Pyrola elliptica. Nutt. *Oral leaved Pyrola.*

"Leaves membranaceous, elliptical ovate, serrulate, rather acute, lamina rather longer than the petiole."

This plant closely resembles the preceding one in habit; but may be easily distinguished from it by the comparative thinness of texture, and the uneven surface of the leaves. Flowers in a similar spike, white with a greenish tinge, sweet scented. Plentiful about Quebec in similar situations.

Pyrola asarifolia. Mich. *Kidney leaved Pyrola.*

"Leaves subreniform, generally emarginate, coriaceous; lamina shorter than the petiole; scape mostly convolute, many flowered; calyx appressed; stamens slightly ascending; style declinate, clavate."

This species also very much resembles the *rotundifolia.* The leaves are of the same consistency, dark green, and wider than long; the flowers are whitish and sweet scented. Abundant about Quebec along with the others.

Pyrola minor, L. *Lesser Pyrola.*

"Leaves roundish-oval, serrulate; scape naked; style short, straight, as long as the erect stamens; stigma peltate."

A smaller plant than any of the preceding species, bearing a scape of white flowers, tinged with red, and regularly disposed around the scape. Leaves leathery. Grows about Quebec in dry grounds.

Pyrola secunda. L. One sided Pyrola.

"Leaves oval, or ovate, acute, serrate; raceme one side; style straight; stigma pellate gibbous."

A diminutive evergreen plant, resembling the *minor;* procumbent at base; leaves thin, smooth, shining, uneven on the surface; scape angular, six inches high; flowers numerous, greenish white, all on one side of the scape. This also grows about Quebec, on dry ground, and on the banks of the St. Lawrence.

Pyrola uniflora. L. Single flowered Pyrola.

"Leaves round serrate; scape one flowered; style straight."

A pretty little plant, with flat smooth leaves near the ground; scape three or four inches high, bearing one white, nodding, fragrant flower. Grows in swamps, but is very scarce in the western parts of the Province; found at Cape Tourment, at the foot of the mountain; and abundantly by Dr. Kelly, R.N. on the shores of the Gulf.

The *rotundifolia*, *minor*, *secunda* and *uniflora* are British plants as well as Canadian. R. A. Salisbury, in Gray's Arrangement, has erected the last into a new genus, by the name of Monises.

CHIMAPHILA. PH.

Chimaphila corymbosa. Ph. *Pyrola umbellata. L.*

Winter green. Pipsessawa. (*Indian name.*)

"Leaves wedge-lanceolate, base acute; scape in an umbel; filaments glabrous."

A small evergreen half shrubby plant, six or eight inches high, with thick leaves of a deep green colour; the flower stalk rises from the centre of the leaves, and bears a cluster of handsome rose-coloured flowers, with a bright green centre. This is one of the articles of Pharmacy among our aborigines. Dr. Somerville brought it into notice during the Government of Sir James H. Craig. It grows abundantly about Quebec, in the company of its late congeners the *Pyrolas.*

Chimaphila maculuta. Ph. *Spotted Wintergreen.*

"Leaves lanceolate, rounded at the base, remotely serrate, marked with long white spots; scape two or three flowered."

This plant has the habit and properties of the preceding species. Both are tonics and diuretics. I have not yet found it in this neighbourhood, but Pursh says (in a MS. note) that it grows about Montreal.

MONOTROPA. L.

Monotropa lanuginosa. Mich. *Wooly Birds'nest.*

"Scale-bearing flowers in a spike; bracts and flowers wooly."

A perennial plant of strange appearance, consisting of a single stem about ten inches high, with small sessile leaves; every part of a yellowish brown and hairy, with a strong scent of musk. Grows at the roots of beech and other trees about Quebec.

Monotropa Hypopithys. W. Common Birds'nest.

"Flowers in a spike; scales and flowers not hairy; lateral flowers with eight stamens."

This plant resembles the foregoing one in habit, but is of more diminutive growth and every part of a dingy yellow. Grows in similar situations in this neighbourhood.

Monotropa uniflora. L. White Birds'nest.

"Scape straight; one flowered."

A small upright plant, composed of a simple stem about six inches high, with a large nodding flower at the summit; every part pure white, brittle, and succulent; sometimes it grows in clusters of three or four together. Grows in dry woods about Quebec. The plants composing this genus are destitute of green leaves, in lieu of which they are provided with scale-like processes on the scape of a like color.

PTEROSPORA. NUTT.

Pterospora Andromedea. Nutt.

A rare and strange looking plant, partaking much of the nature of the *monotropa;* like that genus, it is destitute of leaves and of verdure, consisting merely of single upright "stem one and a half or two feet high, brownish red or purple, clothed towards the base with lanceolate bracts. Flowers numerous, irregularly dispersed on a long raceme; peduncles spreading equally round the stem, sometimes collected in fascicles of four or five, nodding; corolla white, margin reddish, open. Every part of the plant, except the corol, covered with brown viscid hairs." (Torrey.) Grows in groves of the white pine at Marchmont and Sillery, near Quebec.

GAULTHERIA. L.

Gaultheria procumbens. L. Wintergreen. Mountain tea.

"Stem procumbent; branches erect; leaves obovate, wedge shaped at the base; flowers few, terminal, nodding."

A very small evergreen half shrubby plant, with strong, shining, leathery leaves. Flowers in clusters, white, egg-shaped, delicate; followed by red berries, hanging on the plant all winter, when left by the partridges. The whole plant has a strong and peculiar, though pleasant flavor, and is sometimes used as tea, and to convert spirits into a cordial. Common about Quebec, and throughout Canada, in dry pine woods.

Gaultheria hispidula. Muhl. *Creeping Wintergreen.*

"Stem filiform, creeping, hispid; leaves ovate acute; flowers solitary, axillary."

A delicate evergreen creeping plant, growing in thick matted patches at the foot of spruce trees, in moist shady woods. It has the same pleasant flavor as the former species, and is sometimes exposed for sale in market under the name of *thé sauvage.* This plant is octandrous, and in other points does not well agree with the characters of this genus; it has already gone the round of *vaccinium, arbutus,* and *oxycoccus,* and will scarcely remain permanently where it now is; it may become the type of a new genus.

These plants were named in honor of Dr. Gaulthier, whom Kalm found in Quebec, when he visited Canada immediately before the conquest.

HUDSONIA. L.

Hudsonia ericoides. L. False Heath.

"Leaves sharply subulate, hirsute; peduncles filiform, solitary."

A delicate little shrub about six inches high, resembling some species of heath. Flowers yellow. Grows on the

barren plains in the North. I have not seen it in a growing state.

VACCINIUM. L.

Vaccinium resinosum. Ait. *Black Whortle Berry.*

"Leaves stalked, oblong-oval, obtuse, entire, resinous beneath; racemes lateral, one sided, bracteate; corolla ovate-conic, pentangular."

A shrub two or three feet high, irregularly branched; leaves one and a half inch long on short stalks, oval or inverse egg-shaped; flowers red, and disposed in a raceme, followed by black sweet fruit. Grows in swamps at St. Foi and other places.

Vaccinium corymbosum. L. High Whortle Berry.

"Floriferous branches leafless; leaves oblong-oval, acute at each end, nearly entire, the young ones downy; racemes short sessile, bracteate."

This shrub is about six feet high, with leaves one and a half inch long, sessile, finely sawed, grey beneath; flowers white, on an upright raceme; fruit large, black, rather sour. Grows in swamps.

Vaccinium Pennsylvanicum. Lam. *Whortle Berry.* Bluet.

"Branches irregular; leaves sessile, oval lanceolate, mucronate; fascicles of flowers clustered, terminal, sessile; corolla ovate."

A small shrub about a foot high, bearing clusters of white or pink flowers at the ends of the branches, followed by small black or bluish fruit, of a pleasant taste. Leaves about an inch long, hoary when young; branches green, numerous and very irregular. This plant is liable to vary much in appearance, and sometimes in character. Grows abundantly about Quebec and other parts of the country,

on dry grounds and rocky situations. Great quantities of the fruit are brought to market in August.

Vaccinium uliginosum. L. Bleaberry.

"Leaves obovate obtuse, entire, smooth above, veined and glaucus beneath; flowers subsolitary, octandrous; corolla short ovate, fourcleft."

An upright shrub two or three feet high, much crowded with branches and leaves; these are small, half to three quarters of an inch long, and of a leathery consistency, with the margin finely revolute; flowers rose coloured, followed by fruit somewhat resembling the common whortle berry. Found growing abundantly in a swamp at St. Joachim, on the top of a plateau, near the country seat of the gentlemen of the Quebec Seminary. It is a pretty plant, agreeing in habit with the European species. The plant* referred by Dr. Torrey to this species may be a variety; its procumbent habit makes it somewhat distinct from ours.

Vaccinium Vitis Idæa. L. Cowberry.

"Stem creeping; branches erect; leaves obovate, emarginate, serrulate, shining above, dotted beneath; corolla oblong campanulate."

A small evergreen creeping shrub, with short upright branches; leaves thick, half an inch long, blunt, edge rolled back, dark green above, pale beneath; flowers in clusters at the ends of the branches, reddish, nearly bellshaped; fruit small, red, and not pleasant to eat. This pretty little plant has much the habit and appearance of *arbutus uva-ursi*, carpeting the ground in the same way. It is scarce

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* Found on the white hills in New Hampshire, by Drs. Bigelow and Boott, and named by them *vaccinium gaultheroides.*

about Quebec, but there is a large patch of it on the edge of the highway leading to Cap Rouge, near the grove of *Pinus banksiana* at Sillery.

OXYCOCCUS. Pers.

Oxycoccus Macrocarpus. Ph. *Cranberry.* Atocâ.

"Leaves oblong, flat, obtuse; segments of corolla lanceolate."

The cranberry plant is a slender trailing evergreen, with small narrow leaves, arranged in a double row along the stem. The flowers are lily shaped, and of a beautiful rose colour, succeeded by the well known fruit of this name, hanging on the plant all winter. It grows abundantly on the shallow bogs surrounding Lake St. Peter, and in similar situations, subject to periodical inundation. This pleasant fruit is yearly collected in autumn, and brought to market under the Indian name of *atocâ*, the proper French name of *canneberge* not being in use here. It is also sometimes collected in the spring, while yet under water; they have then acquired their beautiful crimson colour, and partly translucent appearance.

Oxycoccus Palustris. Pers. *European Cranberry.*

"Leaves oval, revolute at the edge, acute, white beneath; segments of corolla oval."

This species closely resembles the preceding one, but is a more delicate plant, and less in all its parts. It produces a smaller berry than the other, but equally delicious; indeed by some persons it is preferred before that, by reason of its thinner skin. Grows in sphagnous swamps, hid among the moss, and in company of the *andromeda* and *kalmia* at Sillery and other parts. It is sometimes, though rarely brought to market, as it does not grow so abundantly as

the large fruited kind, and is difficult to find among the *sphagnum*.

LEDUM. L.

Ledum Latifolium. Ait. *Labrador Tea.*

"Leaves oblong, replicate on the margin, ferruginous tomentose beneath; stamens five, as long as the corolla."

An evergreen shrub two or three feet high, with dark brownish green leaves, rust colour beneath; flowers white, in clusters at the ends of the branches. Grows in sphagnous swamps along with the *kalmia*, &c. at Sillery, St. Foi and elsewhere.

Ledum Palustre. L. Marsh Ledum.

"Leaves linear, revolute on the margin, ferruginous tomentose beneath, stamens ten, longer than the corolla."

A small shrub resembling the foregoing one, but of less dimensions. Grows in similar situations, and is to be distinguished from it by the leaves being narrower and rolled back, and not folded back as in that species.

EPIGÆA. L.

Epigæa Repens. L. Ground Laurel.

"Leaves cordate-ovate, entire; corolla cylindrical."

A low trailing evergreen shrub, with stout leathery leaves, two to three inches long, shining both sides, and on long footstalks; flowers white and reddish, very fragrant, at the ends of the branches, opening in May. A beautiful plant, deserving a place in the flower border. Grows in dry grounds and among rocks, at St. Foi, in this neighbor-

hood, St. Paul's Bay, and other places, particularly on the sides of mountains.

KALMIA. L.

Kalmia Angustifolia. L. Sheep Laurel. Narrow leaved Kalmia.

"Leaves ternate, petioled, obtuse, slightly ferruginous beneath; corymbs linear; peduncles and calyx glandular pubescent."

A beautiful evergreen shrub, about two feet high, bearing large clusters of red flowers round the stem, at the termination of the preceding year's growth. It is very showy, and well deserves a place in the shrubbery. Grows abundantly about Quebec, in sphagnous swamps, and on their margins.

Kalmia Glauca. Ait. *Glaucus Kalmia.*

"Leaves opposite, oblong, polished, glaucus beneath, revolute on the edge; branches two edged."

This also is a pretty evergreen shrub, about a foot and a half high; leaves much narrower, and darker green than the other, nearly white beneath, flowers bright rose colour, n clusters at the ends of the branches. A beautiful plant well deserving the attention of the amateur cultivator. It grows in company of the *angustifolia*, very commonly about Quebec and other parts of the country.

RHODORA. L.

Rhodora Canadensis. L. Canadian Rhodora.

A bushy, upright shrub, two or three feet high; leaves oval, entire, greyish beneath, edges rather turned back; flowers large, light crimson, in clusters at the ends of the branches, appearing early in spring before the leaves;

petals unequal. A very ornamental plant, and should be in all shrubberies. Grows near Quebec, in the same swamps with the *kalmia* and *andromeda*.

EMPETREÆ.

EMPETRUM. L.

Empetrum Nigrum. W. Black Crowberry.

"Procumbent; leaves oblong, glabrous, margin revolute."

A small evergreen shrub, growing flat on the ground, with numerous short upright branches, forming thick matted patches; leaves in fours, very small and crowded; flowers reddish, axillary, solitary; fruit a small blackish berry, having the flavour of elderberries. Grows on the rocky shores of the St. Lawrence, within the influence of the salt water. Found at Murray Bay, Riviere du Loup, and other places below Quebec.

ARISTOLOCHIÆ.

ASARUM. L.

Asarum Canadense. W. Wild Ginger.

"Leaves reniform, mucronate."

A small perennial herbaceous plant, with a few broad kidney-shaped leaves on long footstalks, and in pairs; petioles and leaves covered with short jointed hairs; flower dark brown, on a short stalk near the ground; opening among the first flowers in May. The root is pungent, strongly aromatic, and is said to possess some medicinal qualities. Grows in shady woods.

ACERINEÆ.

ACER. L.

Acer Rubrum. L. Red Maple. Plaine.

"Leaves on long stalks, cordate about five lobed, smooth, glaucus beneath segments acuminate, cut toothed, umbels erect."

A tolerably large tree of handsome appearance, when growing in open grounds. It shews its flowers in April before the leaves expand; the profusion of bright red and lively yellow blossoms, enlivening the woods where this tree abounds, often when patches of snow yet remain on the ground. Again in autumn, when most trees assume a russet attire, this and some of the other maples put on rich dresses of all shades of red, from deep crimson to flaming orange, giving to the forest that gay and variegated appearance, of which the landscape painter avails himself for the embellishment of his scenery. The timber is white, and at the heart of a reddish hue; frequently, when full grown, shewing that beautiful undulating appearance, called curled maple, which is worked up into cabinet work. The wood is not in request for fuel, when better is to be had. The maples abound in a saccharine sap, which is manufactured into sugar to some extent; but the sap of this species is much weaker than that of the sugar maple, for which reason, as well perhaps of its less pleasant flavour, it is seldom used for that purpose, except in the absence of the other.

With the inner bark, dies of different shades of blue and black may be prepared, with proper additions of copperas; it therefore contains gallic acid, and probably the tanning principle, generally found together; it forms one of the colouring materials of our Indian women.

This tree usually grows in lands subject to periodical inundation, in company of the swamp ash, Canadian elm, and alders; but it is also found in very different situations, such as the high dry lands near the Plains of Abraham.

Acer Dasycarpum. W. White Maple. Erable Blanc.

"Leaves cordate, five lobed, whitish and smooth beneath; segments acuminate cut toothed; flowers in capitate umbels."

The white maple is a rather tall tree, sending out numerous branches low down the trunk, making it assume a large bushy head. The divisions of the leaves are drawn out into long narrow points, are bright green above, and nearly white beneath, contrasting finely in the wind. It is altogether a picturesque tree, very fit for park scenery. The timber is soft, white, and of little value, not being used for any purpose that I know of, except for inlaying furniture by the cabinet-maker. Bark grey and smooth. The inner bark is capable of producing the blue and black dies; and the sap is saccharine in about the same degree as red maple, therefore seldom resorted to for the purpose of making sugar. The usual places of growth of the white maple, is on the alluvial deposits on the margins of rivers; it may be seen in such situations at the outlet of the rivers Chaudiere and Etchemin, near this city.

Acer Saccharinum. L. Sugar Maple. Erable.

"Leaves subcordate, acutely five lobed, downy beneath; lobes nearly entire, corymbs before the leaves loose, nodding."

The sugar maple is a tree of tall upright growth, irregularly spreading at top, equalling the lime tree in height, and almost in bulk of stem. The bark is of a grey colour, and remarkably ridged longitudinally, with deep unequal

furrows. The leaves are broad, lobed and cut; the bays wide and rounded at bottom, both sides nearly alike in colour. It flowers in April and May, ripening its seeds early in autumn.

In domestic economy, this is one of the most useful trees that the Canadian forest produces. The wood is hard, heavy and close grained, constituting the very best of fuel for inclosed fire-places; it is in much request with the cabinet-maker and house carpenter, especially that variety which is so beautifully marked with dots and rings surrounding them, known by the name of bird's-eye maple; and that with undulations, or the curled maple. These kinds of wood do not regularly exist in the tree, but are supposed to be produced by some properties in the land, uncongenial to its quick and free growth; yet a conjecture might be ventured, whether these appearances in the wood may not be formed by the passage of the embryo buds through the stem of the tree, either in their passage upwards, or from the centre towards the bark, or perhaps both; some woodmen, however, have formed the opinion that a disease, or stinted growth, is the cause of these beautiful formations, and are so well acquainted with outward appearances as to fell a maple, with a certainty of finding the markings sought for. This kind of timber is very frequently made up into tables, desks, wardrobes and other furniture; also into pannel work, in the inside finishing of rooms and ships' cabins; unfortunately it does not take glue well, being very apt to open at the joinings, perhaps owing to the closeness of grain of the wood.

The value of this tree to the proprietor is, however, much more extensive in the growing state, than when converted into timber. From its rising sap in spring is procured an

excellent sugar, one of the comforts, if not quite a necessary of life. In the month of March, the farmer, with a suitable party, repairs to his maple grove, frequently at a considerable distance from home, provided with snow shoes, buckets, boilers, and other necessaries for the manufacture of sugar, after the most simple process, together with other indispensable articles for a month's residence in the forest. In the fine sunny days of March, the ascending sap flows freely from small incisions, made with an axe or auger through the bark, and about a foot or two from the ground, particularly after frosty nights; this sap is made to run into wooden troughs placed near the tree, and is collected by the men, going from tree to tree, into buckets, and carried to the evaporating boiler at the encampment; it is there boiled down to a thick syrup, and poured into moulds to harden. In the Lower Province, maple sugar is always formed into a concrete hard mass, which requires to be grated down for use. In Upper Canada, it is manufactured into a granular state; not, however, by the ordinary process of crystalization, but by continually stirring the syrup until all the moisture is evaporated, and the sugar left in powder. The trees will continue to produce sap during five or six weeks, each furnishing about two gallons a-day on an average, four or five gallons yielding a pound of sugar; but towards the end of the following season the sap becomes incapable of hardening into good sugar, and acquires a peculiar and somewhat unpleasant flavor. To the sugar then made is applied the name of *sucre de séve*, and serves to announce the expediency of breaking up the encampment, and repairing home with the sweet produce of their labors; a small quantity of syrup being previously collected in bottles, for use as treacle.

The sugar maple is generally diffused throughout the province, clothing almost exclusively the upland undulating countries lying parallel with, but frequently at some distance from the St. Lawrence: this kind of land is very generally preferred by one class of settlers for the formation of farms, especially when there is a sprinkling of basswood, elm and butternut among it, indicating a deep, mellow, friable loam. An opportunity has lately occurred of noticing extensive growths of this tree on formations of mica slate.

Acer Striatum. Mich. F. *Pennsylvanicum.* L. *Moosewood, Striped Maple.*

"Leaves with three acuminate lobes, rounded at the base, acutely dentate, smooth; racemes simple, pendulous."

A spreading shrub or small tree, ten or twelve feet high, bearing large deep green leaves, less cut or divided than other maples. The bark is green and beautifully striped with black, or dark green approaching to black.

Moose are said to be fond of the young branches of this tree and feed on them in winter and spring, with those of birch and other trees. The timber is of too small growth to be applied to any useful purpose: but as an ornamental plant it may find a place in shrubberies and plantations; its fine broad leaves and long pendulous racemes of yellowish flowers rendering it a desirable plant for this purpose. Abundant about Quebec in dry and strong grounds.

Acer Montanum. Ait. *Mountain Maple.* Erable batard.

"Leaves about five lobed, acute, serrated, downy beneath; racemes compound, erect."

This is also a shrub of about the same dimensions as the

preceding one; and like it applicable to no other purpose than as an ornamental plant. The leaves are comparatively small and more divided than the last; and the plant is peculiar in having erect racemes of flowers of handsome appearance. Common in hilly grounds about Quebec and elsewhere in Canada.

Acer Nigrum. Mich. F. *Black Sugar Maple.*

"Leaves cordate, five lobed, downy beneath; corymbs sessile, nodding; fruit smooth."

This is said to be a large tree closely resembling the *saccharinum*, and possessing similar properties. I have not yet had an opportunity of observing this tree, therefore have nothing to offer respecting it. Supposed to grow in Upper Canada.

ROSACEÆ.

PRUNUS.

Prunus Virginaina. W. Wild Cherry. Cerisier.

"Flowers racemose; racemes erect; leaves deciduous doubly toothed, smooth; stalks with four glands."

A tall upright tree, attaining in the forest a considerable height; in this province, however, it does not acquire the bulk of stem and altitude that it does on the southern shores of Lake Erie and Ontario, attaining there, in the rich land that it delights in, very large dimensions. The timber is there sawed into boards, plank, and scantling, and brought down here for the use of the cabinet maker; it is of a light red colour and frequently veined like mahogany, looking little less beautiful when properly stained and varnished.

The flowers are in long upright racemes, followed by long branches or clusters of small black cherries, something like the choke cherry. The bark is of a dark colour, and detaches from the stem in large flakes. Grows in Lower Canada, south of the St. Lawrence.

Prunus Serotina. Ehrh. *Choke Cherry.* Cerisier à grappes.

"Flowers in loose racemes; leaves deciduous, simply serrated; lower serratures glandular, rib bearded towards the base."

The choke cherry tree frequently attains a height of thirty feet, but its trunk does not become sufficiently bulky to be of use as timber. Bark greyish brown, and like the wild cherry tree, detaches itself from the stem when old. Flowers in long inclined racemes, very fragrant, and followed by small fruit, dark red, black, and sometimes white; very astringent and rough in the mouth when eaten, whence is derived its name. The fruit, notwithstanding its roughness, is readily devoured by the birds, the trees being stripped by them almost as soon as ripe; it is also sometimes collected for the purpose of giving a flavor to spirits in imitation of cherry bounce. The bark contains prussic acid, and is, by the Indians, sometimes used as a vulnerary article of their materia medica. Spread very generally throughout Canada.

Prunus Pennsylvanica. W. Small Red Cherry. Merisier.

"Umbel subsessile, aggregate, many flowered, at length pannicled; leaves oblong lanceolate, serrated, smooth."

This is an upright slender tree, about twenty feet high, with smooth, shining, brown bark, and many upright fine branches. Flowers white, in close clusters, succeeded by small red fruit, remarkably acid. From the stem and

branches of this tree when wounded, exudes a reddish gum, much resembling and perhaps possessing the properties of gum arabic: this may become of some value in future times. The timber is of small dimensions, and not applied to any useful purpose. Grows every where throughout the province; abounding most in dry sandy situations.

Prunus Nigra. W. Black Cherry. Cerisier noir.

"Umbel sessile, solitary, few flowered; leaves deciduous, ovate, acuminate, finely serrated; petioles with two glands."

A small tree, about twenty feet high, producing, in September, a black and rather pleasant fruit, somewhat larger than the choke cherry: this fruit is also used to make cherry brandy. Grows sparingly on the banks of the St. Francis and L'assomption; it is rather scarce in general. I have not seen enough of it to give a more satisfactory description.

Prunus Depressa. Ph. *Sand Cherry.*

"Umbel sessile, clustered, few flowered; calyx obtuse; branches angular, prostrate; leaves cuneate, lanceolate, glaucus beneath."

This species is a low recumbent shrub, seldom rising above a foot high. It produces a small, black, dry fruit, not eatable. Grows on the sandy shores of the St. Lawrence, at the island of Orleans, the island of Montreal, and other places. It is not a plant of any interest.

Prunus Pygmæa. W. Pygmy Cherry.

"Umbels sessile, aggregate, few flowered; leaves ovate elliptical, acute, smooth on each side, with two glands at base."

A low shrub, about four feet high, producing black indifferent fruit, about the size of the choke cherry. Collected

on the banks of the Ottawa, by Pursh, who gave me a specimen. I have not yet observed it in a growing state.

Prunus Americana. Marshall. *Wild Plum.* Prunier.

"This (tree) generally rises to the height of twelve or fifteen feet, spreading into many stiff branches. The leaves are oblong, oval, acute pointed, sharply sawed on the edges and much veined. The flowers generally come out very thick round the branches, often upon thick short spurs, and are succeeded by large oval fruit, with a sweet succulent pulp. We have a great variety of these growing naturally in a good moist soil, with a reddish and yellowish fruit, but differing much in size, taste, and consistence."* This is Humphry Marshall's description of our common wild plum, and it appears to be very full and accurate. I find no mention of this plant by recent authors; nor can I account in any way for its having been overlooked by them, especially as it was so well described by Marshall so long ago as 1785. Grows in the neighbourhood of Montreal, and sparingly in other parts of the province; has been introduced into gardens and improves much by culture.

SPIRÆA.

Spiræa Salicifolia. L. Willow-leaved Spiræa.

"Leaves oblong, serrated, smooth; racemes decompound."

A small upright wand-like shrub, two or three feet high,

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* This paper was read in General Meeting of the Society on 23d March, 1830. On the 11th of April following, Easter Sunday, I first saw Dr. Darlington's paper in the Annals of the Lyceum of New York, on this species of *prunus.* He has treated the subject very fully. Several years ago I sent a specimen of this plant to Dr. Torrey, supposing it to be *prunus chicasa;* but having subsequently studied it afresh for this paper, I saw reason to adopt Marshall's specific name.

with a few branches, producing its clusters of flowers at the summit. It grows in swampy grounds, and is of little or no interest.

Spiræa tomentosa. L. Tomentose Spiræa.

"Leaves lanceolate, unequally serrate, downy beneath; flowers doubly racemose."

This is a pretty little upright shrub, with few or no branches, about two feet high, and terminated by a conical bunch of handsome pink flowers, which with the woolly stem and under surface of the leaves, render this rather an interesting plant for the garden. Grows in swampy situations about Sainte Foi and various other parts of the province.

Spiræa Opulifolia. L. Guelderrose Leaved Spiræa.

"Leaves ovate three lobed, serrated; corymbs stalked.

A spreading bush of four or five feet high, composed of numerous slender branches; bearing leaves resembling those of the snowbob, and dense clusters of small whitish flowers at the ends of the branches; followed by bunches of permanent inflated seed vessels. Grows along the rocky shores of the St. Lawrence; very common about Quebec. This plant is not void of interest as an ornamental shrub.—It is commonly called Ninebark.

DRYAS.

Dryas octopetula. W. Mountain Dryas.

"Leaves ovate, oblong, coarsely toothed, rugose, white tomentose beneath; peduncles one flowered."

Pursh, in his visit to Anticosti, found a Dryas, which he supposed to be a new species, and gave it the name of

"*geoides.*" He gave me some specimens, but which come so close to the description of *octopetala*, that I am disposed to think it not essentially different;—yet, the leaves are wider, somewhat obovate and hairy above, petiole shorter than the leaf; the stipules narrow lanceolate; two small bracts or scales on the scape. The opportunity of studying a recent specimen may, probably, establish it a new species.

Dryas Tenella. Ph.

"Leaves small, ovate, acute, heartshaped at base, entire, flat beneath, snowy tomentose; peduncle one flowered."

Pursh also brought this little plant from Anticosti, naming it *rosmarinifolia;* but it does not appear to differ from *tenella;* it seems more shrubby than the *octopetala.* They are both pretty little evergreen, half shrubby plants, growing in tufts, close on the ground.

GEUM.

Geum Strictum. Ait. *Upright Avens.*

"Flowers erect; awns hooked naked; cauline leaves pinnate, leaflets and stipules split; petals longer than the calyx."

A herbaceous perennial plant, about two feet high, with very radical leaves, irregularly feathered, terminating in a large round leaflet, somewhat heartshaped and divided into three or more lobes: the stem leaves are progressively smaller and more divided. The flowers are produced at the top of the stem, in a loose cluster, large, and of a yellow colour. Grows by the sides of brooks and other moist places about Quebec.

Geum Virginianum. L. Small White Flowered Avens.

"Flowers erect; awns hooked naked; cauline leaves ternate, upper ones lanceolate; petals shorter than the calyx."

A plant of similar habit with the preceding one. Grows on the banks of the Ottawa, on the authority of Pursh.* I have not met with it.

Geum Album. W. White Flowered Avens.

"Flowers erect; radical leaves pinnate, cauline ones ternate, upper simple; lower stipules cut; petals length of the calyx."

A perennial plant about two feet high: much divided at top into many slender branches, terminated by white flowers. Grows about Quebec, in moist grounds.

Geum Rivale. W. Water Avens.

"Flowers nodding; petals length of calyx; awns feathery, twisted in the middle."

This plant differs from the preceding ones, in the flowers being turned down, and of a brownish purple colour; it grows about Quebec, on the margins of brooks and other moist situations. Miller says its roots are astringent and aromatic, and used by the Canadians in the cure of agues.

Geum Geniculatum. Mich.

"Subpanicle many flowered; cauline leaves, subsessile three parted; stipules entire, petals wedge-inverse heartshaped, awns hairy throughout, bent in the middle."

Pursh says this species is to be found on the banks of the Ottawa. I have never seen it.

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* Pursh's MS. Notes.

RUBUS.

Rubus Idœus. W. Raspberry of Europe.

"Leaves quinate, pinnate and ternate, rugose, smooth both sides; stem, petioles and peduncles prickly; raceme terminal."

The European Raspberry is found in Canada, but very sparingly; localities on the Ottawa, and of the white fruited variety at Sorel. Its habit here is more diminutive than in Europe, and is upright; this character will serve, at first sight, to distinguish it from the Canadian Raspberry, which puts on a more spreading, branching shape. This is the species commonly admitted into gardens for the sake of its fruit; both the plant and shrub are much increased in size by culture.

Rubus Occidentalis. W. Black Raspberry. Catherinette.

"Leaves ternate; leaflets ovate, acuminate, somewhat lobed, coarsely serrate; hoary tomentose beneath; petioles terete; racemes terminal."

This species grows to a height of four or five feet, with beautifully arched stems, of a purplish colour, covered with greyish powder, easily rubbed off; and furnished with a few strong hooked prickles. Flowers at the ends of the branches in bunches, mixed with leaves; and followed in September by eatable fruit, shaped like the common Raspberry, but of a firmer consistency and black, covered with bluish bloom. Grows very commonly in dry sandy lands.

Rubus Villosus. W. Blackberry. Mur.

"Leaves fivecleft, acuminate, finely serrate, villous on each side; stems and petioles prickly."

This plant grows very generally in every part of the Province, bearing a sweet black fruit, not detaching from the

receptacle, as in the Raspberry, lengthened more or less into the shape of the Mulberry fruit; from which resemblance is supposed to be derived the Canadian name of *Mur.* The Blackberry is commonly found in dry lands of indifferent quality. The stems are angular, prickly, and grow in a spreading irregular manner, attaining a height of four or five feet. Flowers large, white, in long loose bunches; the lower fruit ripening first, the others in succession upwards.

A marked variety, if not a distinct species, is of more humble growth, with smaller leaves, fruit of a roundish shape, and flowers highly fragrant. The two grow frequently together, and preserve their respective characters distinct, yet it is difficult to find any botanical differences between them.

Rubus Strigosus. Mich. *Canadian Raspberry.* Framboisier.

"Unarmed, hispid; leaflets three or pennate quinate, ovate, blunt at base, white beneath, the odd one (sometimes) cordate."

Our common Raspberry is a plant of more spreading, irregular growth than the *Idæus;* and is found as generally diffused throughout Canada as the Blackberry. The stem is about three feet high, has no prickles, but is covered with short stiff bristles; which character may serve at sight to distinguish it from the species first mentioned. This plant grows abundantly in dry sandy lands and rocky situations; bearing abundance of fine red fruit, resembling the European kind; and which is brought to market in great quantities in July, following close upon the Strawberries; they are eaten fresh, with milk, and made into sweetmeats.

Rubus Odoratus. W. Rose Raspberry. Calottes.

"Leaves simple, palmate; stem unarmed, many leaved, many flowered."

A handsome spreading shrub, three or four feet high, bearing large reddish purple flowers, resembling a single rose; succeeded in August by large round fruit, of a dark red colour, detaching very freely from the receptacle; but it is acid, not very pleasant to eat. Grows commonly in every part of the Province, in dry rocky situations. This plant is sometimes admitted into gardens and shrubberies as an ornamental plant.

Rubus Canadensis. W. Purple stalked Bramble.

"Smoothish; leaves digitate in fives and threes, lanceolate, naked each side, finely serrated; stem unarmed; bracts lanceolate."

The stems of this species are very slender, smooth, purplish brown, reclining on the ground; producing short upright branches every four or five inches of their length; on which are the leaves, the lower ones sometimes in fives, the others in threes, and terminated by lengthened fruit stalks, supporting one, two, or three white flowers: these are followed, in July, by small red fruit, adhering to the receptacle, sour but pleasant, and known by the country people by the name of *Fraises courantes.* Grows on the sides of hills and rocky situations.

Rubus Hispidus. W. Bristly Bramble.

"Leaves three, naked; stems and petioles very hispid, bristles stiff."

This is also a decumbent species, somewhat resembling the foregoing one. I have not seen it. Pursh found it growing at Anticosti.

Rubus Chamœmorus. W. Cloudberry.

"Leaves simple, lobed; stem unarmed, one flowered."

A small upright herbaceous species, bearing amber coloured fruit. Found also at Anticosti, by Pursh.

Rubus Triflorus. Richardson. *American Stone Bramble.*

"Leaves ternate, naked; leaflets rhomboid, acute, cut serrate, the odd one stalked; flowers, about three."

A herbaceous running plant, growing among rocks, and producing black sweet fruit. This seems to be the same plant as Michaux's *Rubus saxatilis* var. *Canadensis:* no synonim is given.

The *trivialis*, *articus*, *pistillatus*, and probably other species, may prove to be natives of Canada.

DALIBARDA. MICH.

Dalibarda Repens. Lam. *Violet Leaved Dalibarda.*

"Leaves simple, cordate, crenate; peduncles one flowered."

A small herbaceous perennial plant, sending out rooting runners close on the ground, from the joints of which rise up, on a long slender stalk, a single heartshaped leaf, somewhat hairy; as is also the petiole and peduncle: the latter also rising from the joints, very slender, with one narrow acute bract below the middle, and supporting a single white flower. Grows in dry pine woods about Quebec.

FRAGARIA. L.

Fragaria Virginiana. L. Wild Strawberry. Fraisier.

"Calyx of fruit spreading; pubescence of petioles erect, of peduncles adpressed; leaves smoothish above."

Our Wild Strawberry, when growing in the fields, is

seldom above two or three inches high, whereas, when growing in shady woods, will rise to a height of six or eight inches, the bunches of flowers then generally overtopping the leaves, and bearing fruit much larger than in exposed situations. I have observed a very marked variety in several places, having leaves and fruit very much resembling the Alpine Strawberry of the gardens; but, not having gathered specimens of it, I am unable at present to describe it; it may possibly be the *Canadensis* of Michaux. The fruit of the Wild Strawberry is brought to market in abundance in June and July; although not of a large size, is of very delicious flavour, and is frequently preserved for winter's use.

POTENTILLA.

Potentilla Tredentate. Ait. *Trifid Leaved Potentilla.*

"Leaves ternate, cuneiform, trifid at the end."

A slender herbaceous perennial plant, about six inches high, producing a few ternate radical leaves, and one of same shape half way up the stem, with some narrow bracts in threes at the forks of the peduncles above. The flowers are white and pretty; the plant altogether is rather interesting, the blunt and notched leaves giving it an unusual appearance. Grows in some abundance on the Plains of Abraham. Pursh's specimens from Anticosti are very diminutive, and only about three inches high.

Potentilla Hernita. Mich.

"Stem erect, simple; leaves ternate, petiolate; leaflets roundish, hairy, unequally dentate serrate; teeth obtuse; petals shorter than the calyx."

An annual plant, much tufted at the bottom, with numerous radical leaves, all in threes, and in long slender hairy

footstalks. Stalk erect, about a foot high, hairy, and furnished with three or four leaves shaped like those at the root, and provided with wide, entire stipules. Flowers in a cluster at the summit, intermixed with leaves; petals small, pale yellow or white. This is a common weed in gardens, and very much resembling the following one.

Potentilla Norwegeca. L. Norwegian Potentilla.

"Leaves ternate; stem dichotemous; peduncles avillary; stipules oval dentate."

This is also an annual plant, in habit much resembling the *hirsuta*, but may be distinguished from it by the different stipule, and, being branched like it, it is an unwelcome intruder in our gardens. Flowers yellow, petals obovate and shorter than the calyx.

Potentilla Opaca. W. Small Rough Potentilla.

"Radical leaves in fives and sevens, ovate, wedge shaped, toothed; petals retuse, the length of the calyx; stem filiform decumbent, hairy."

A slender spreading decumbent plant, with several radical leaves on very fine footstalks, leaflets generally in fives, and oval or eggshaped, not linear as described; cauline leaves similarly shaped, but on shorter stalks; stipules lanceolate, entire; peduncle axillary long, very slender, and bearing a single small deep yellow flower; stems several, all from the root and not branched; comes near Michaux's *simplex*. Grows at Sillery and Point Levi.

Potentilla Argentea. L. Silvery Potentilla.

"Stem ascending; leaves quinate; leaflets cuneiform, incised, white and tomentose beneath; petals retuse, a little longer than the calyx."

An upright perennial species, branched, and attaining a

height of about ten inches, bearing clusters of small yellow flowers, surrounded by young leaves; radical leaves few, sometimes but one, on a long stiff stalk; leaflets subdivided into narrow segments. Found at Cape Torment, on the shore.

Potentilla Anserina. L. Wild Tansey.

"Leaves interuptedly pinnate, silky; leaflets finely serrate; stem creeping; peduncles one flowered."

This plant is common to the old continent, as well as to this, growing generally in wet places. Radical leaves several, silky and nearly white beneath; leaflets from five to ten pairs, and the terminal one with small ones between. The stems are decumbent rooting at the joints, where the peduncle is produced bearing a large yellow flower. Grows on the shores of the St. Lawrence about Quebec.

Potentilla Florabunda. Ph. *Cluster Flowered Potentilla.*

"Leaves pinnate; leaflets linear oblong, revolute at the edge; petioles short; corymbs terminal."

A handsome bushy flowering shrub, about two feet high, producing numerous spreading branches; leaves pinnate, with two or three pairs and an odd one; grey beneath, finely silky as well as the young branches; stipules oval lanceolate, entire and pellucid. Flowers large, yellow, numerous at the ends of the branches, rendering it an ornamental plant, fit for garden culture. Found on the shores of the Gulf of St. Lawrence, by Dr. Kelly, R. N.

Potentilla Fruticosa. W. Shrubby Potentilla.

"Leaves pinnate; leaflets linear oblong flat; petioles long; branches one or two flowered."

This species closely resembles the preceding one; but is

said to be of more robust habit. Pursh notes having observed it at Anticosti.

AGRIMONIA. L.

Agrimonia Parviflora. W. Small Flowered Agrimony.

"Fruit hispid; cauline leaves pinnate, with many lanceolate leaflets; petals half as long again as calyx."

A herbaceous perennial upright plant, about two feet high, with leaves interruptedly pinnate; the terminal leaflet sessile, all coarsely toothed; stem terminating in two or three long racemes of numerous sessile small yellow flowers, supported by narrow sharp bracts. Grows by the sides of roads about Quebec.

Agrimonia Eupatoria. W. Common Agrimony.

"Fruit hispid; cauline leaves pinnate, with oblong ovate leaflets; spike elevated; petals twice as long as the calyx."

This species grows at Montreal, on the authority of Pursh. I have not seen it.

COMARUM. W.

Comarum palustre. W. Marsh Cinquefoil.

"Leaves pinnate; petals smaller than the calyx."

A perennial herbaceous plant, about two feet high, and having the appearance of a *potentilla.* The leaves are pinnate, generally with five leaflets, on a winged stalk, growing shorter upwards; the peduncles spring from the axils of the leaves and also terminate to plant, bearing large flowers with brown petals, exceeded by the sharp segments of the calyx. The leaflets about an inch or an inch and a half long, oval or inverse egg-shaped, coarsely

and very sharply sawed. Grows in swamps and brooks about Quebec.

SANGUISORBA. L.

Sanguisorba Canadensis. W. Canadian Great Burnet.

"Spike cylindrical, very long; stamens much longer than the corolla."

A herbaceous perennial plant, about three feet high, upright, slender, with few leaves on the stem; these are pinnate with three or more pairs and a terminating leaflet; sharply sawed; stipules large, leaf-like, sawed; spikes four or five at top, about four inches long. Grows in meadows and waste grounds about Quebec.

ROSA. L.

Rosa Blanda. W. Hudson's Bay Rose.

"Germ globular, smooth; older branches and peduncles smooth, unarmed; leaflets seven, oblong, subequally serrate, smooth; petioles smooth with few prickles."

A small shrub of two or three feet in height, with slender dark red or purple branches, having a few weak prickles towards the top; germ round and of a very dark purple colour with a thin white blush over it; leaves sharply sawed, oval, and greyer beneath; roses large, handsome. Grows on the banks of the river at Point Levi.

Rosa Parviflora. Ehrh. *Small Flowered Rose.*

"Fruit depressed globose, and with the peduncles hispid; petioles pubescent, somewhat prickly; stem smooth; stipular prickles straight; leaflets elliptical lanceolate, simply serrate, smooth when mature; flowers generally in pairs."

This shrub is about three or four feet high, furnished with numerous yellow branches, and thickly beset with fine

straight prickles. My specimens, gathered at Point Levi, vary much from the specific description; as in the fruit being smooth, the stipules very wide, and the prickles being closely set on the stem, sharp, white, and surrounded at base with a brown raised margin. It appears to come near the *canina* of Europe.

Rosa Inermis. Ph.

In Pursh's list of plants collected at Anticosti, he has a rose thus named, with the mark N. S. after it, meaning new species. I have no description of it.

CRATÆGUS. L.

Cratægus Coccinea. W. Scarlet Fruited Hawthorn.

"Spiny, leaves cordate, ovate, cut angular, smooth; petioles and calyx glandular; styles fine."

A large thorny shrub, producing numerous upright branches, even from the bottom. Flowers in May, in large white clusters at the ends of the branches; succeeded in autumn by small round red fruit. This tree answers equally well with the English thorn for making quick hedges: with proper treatment it will become a thick impenetrable fence, and to which we shall in all probability be under the necessity of having recourse sooner or later to inclose our fields.

Cratægus Pyrifolia. W. Pear Leaved Thorn.

"Leaves ovate elliptic, cut serrate; somewhat plaited and hairy; calyx villous, segments linear lanceolate; styles three."

This shrub is of somewhat larger growth than the preceding one, and equally bushy; it may probably answer as well the purpose of making hedges. Flowers in May, white,

in clusters. Fruit red, oval, and eatable. Grows generally in stony places, frequently in company of the scarlet fruited thorn.

Cratægus Glandulosa. W. Hollow Leaved Hawthorn.

"Spiny; leaves oval wedge-shaped, angular, smooth, shining; petioles, stipule, and calyx glandular; berries oval, with five seeds."

A shrub of similar habit with the preceding ones, differing however in the shape of the leaf and in other particulars. Fruit oval, scarlet. Grows at Sorel, the Ottawa, &c.

Cratægus Punctata. W. Spotted Fruited Hawthorn.

"Leaves obovate, cuneiform, angular, smooth, serrated; calyx villous, segments subulate, entire."

This thorn frequently grows with a single stem to a tree of singular but beautiful appearance, to a height of about twenty feet; it produces its branches all at the summit, and spread out horizontally so as to cover a great space of ground compared with the altitude of the tree. In open spaces where it has room to assume its natural shape, and when contrasted with trees of spiry growth, it is altogether a very picturesque object, worth the attention of the landscape painter. Flowers in spreading clusters in May; followed by fruit ripe in October, red or yellow, dotted with black spots, large globular, two or three seeded, eatable and commonly known by the name of *pommettes.* Grows in stony grounds, in open fields about Quebec, and various other places.

Other species of *cratægus* are no doubt natives of Canada, as *crusgalli*, *populifolia*, *flava*, and *elliptica;* but I have not met with them.

AMELANCHIER. LINDLEY.

Amelanchier Botryapium. Lind. *Snowy Amelanchier.*

"Leaves oblong elliptical, cuspidate, smooth; sepals smooth; germ pubescent."

A slender tree, growing to a height of thirty feet or more, and attaining a bulk of about six inches. It usually rises with a single straight stem, with branches spreading moderately upwards. The flowers are white, in long clusters at the ends of the branches, appearing in May before the leaves are quite expanded: the tree at that season puts on the appearance of being covered with snow. The fruit is a dark red or purple berry, ripe in June, very sweet and melting in the mouth: in the country parts this small fruit is dignified with the name of *poire*, more from its fine flavor, it is presumed, than from any resemblance to pears.

The leaves as they expand are covered with a white downiness, which disappears when full grown: they then become smooth, and of a reddish green colour. Grows generally in stony lands: plentiful about Quebec.

Amelanchier ovalis. Lind. *Oxal Leaved Amelanchier.*

"Leaves roundish elliptical, acute, smooth; petals obovate; sepals and germ pubescent."

This species resembles the foregoing one in many respects, particularly in the fruit, which is also known by the same common name; but the tree is of much humbler growth and more bushy. The leaves are wider and lighter green than the snowy amelanchier. The flowers also in pendulous branches, white, appearing in May with the other, and the fruit ripening simultaneously. An ornamental shrub, and grows generally in company of the other.

PYRUS. L.

Pyrus Melanocarpa. W. Black Fruited Pyrus.

"Unarmed; leaves obovate oblong, acuminate, serrated, smooth beneath; rachis glandular above; calyx smooth."

A spreading shrub about four feet high, with dark green leaves, the upper surface shining. Flowers in spreading clusters at the ends of the branches; petals roundish, white tinged with red. Fruit ripe in August, small, black, shining, and highly astringent; yet it is esteemed by children notwithstanding its quality of puckering up their mouths and staining them black: hence is derived its common name of *geuele noire.* Grows commonly by the sides of ditches and other moist places: common about Quebec. A very ornamental little shrub.

Pyrus Americana. W. Canadian Mountain Ash.

"Leaves pinnated; leaflets acute, almost equally serrated, and common petiole smooth."

A small upright tree, about fifteen feet high, generally rising with a single straight stem, and spreading moderately upwards. Flowers at the ends of the branches in large spreading clusters, white and highly scented. Fruit small, red, in globular bunches; ripe in September, astringent, not eatable, but very ornamental when suffered to remain on the tree by the birds, who devour them greedily. The buds and bark of this tree have the peculiar taste of bitter almonds, which may be imparted to spirits giving the flavor of noyeau. This is a highly ornamental tree in plantations, especially in autumn when loaded with its large clusters of bright red fruit. Grows in stony lands about Quebec, and very commonly in higher latitudes. Its fruit is known here by the aboriginal name of *Masquabina.*

ART V.—ON THE MAGDALEN ISLANDS, BEING THE SUBSTANCE OF FOUR REPORTS, BY LIEUTENANT BADDELEY, R. E.

INTRODUCTORY.

In the autumn of the year 1831, the Government hired Brig *King Fisher*, being under orders for the Gulf upon Colonial services, I was honored with His Excellency Lord Aylmer's commands to proceed to the Magdalen Islands, by that opportunity, and, on my return, to report upon them, under certain heads of instructions, with which I was furnished.

Owing to the lateness of the season, and to the necessity we were under of visiting other places, our detention off the Magdalen Islands was only of nine days duration, a period totally inadequate to afford me the opportunity of giving a full description of them; a fact which I must urge as *one* excuse for what will be found defective in the present attempt.

Upon submitting my Reports to His Excellency, he condescended to suggest that I should present to the Literary and Historical Society at Quebec, such portions of them as might be likely to interest that body; on doing which they were ordered to be published in the third volume of its Transactions.

The principal suppressions are in the third Report, which, having been originally of a military character, contained matter now, for obvious reasons, withheld.

The writer can put forth little claim to originality in the first and fourth Reports, as they are, for the most part, compilations of the opinions and assertions of others. This,

indeed, is necessarily the case, as the want of time and experience on such subjects would render negative those opinions which he might otherwise have ventured to offer. Almost all such as have been advanced were either obtained or confirmed upon the spot, and are, consequently, entitled to credit, particularly as the individuals consulted are among the best informed and most respectable on these islands.

FIRST REPORT.

COMMERCE AND REVENUE.

READ BEFORE THE SOCIETY, 21ST DECEMBER 1831.

No trade whatever, in the way of export, is carried on in the Magdalen Islands, in any article which is not the produce of the fisheries, with the exception of furs, skins, feathers, cranberries and red ochre; and the amount of these is very small. The great staples of these islands are cod-fish and its oil, the former either pickled or dried; but an uncertain fishery in seals is also pursued, the oil and skins of which form valuable items of commerce. Considerable shoals of herrings visit the islands in the spring; but they are not made, to any extent, an article of export by the residents, although the Americans and Nova Scotians carry off large quantities of them annually. About thirty years ago, an extensive business was pursued in oil obtained from the Walrus, commonly called the sea-cow or sea-horse; no other vestige, however, of this amphibious animal is now to be seen, except its long ivory tusks, which are sometimes thrown up upon the beach in stormy weather; their defection has been attributed to the indis-

criminate slaughter which was formerly made of them, particularly of the females at the periods of their parturition.

The seal fishery is the first which engages the attention of the inhabitants upon the breaking up of the winter, and it is succeeded by the cod fishery, which continues until late in the autumn; the certainty of the latter gives it a decided advantage over the former. The furs and skins, seal skins and fox skins excepted, are not productions of the islands, but are brought from the coast of Labrador. Lobsters, crabs, and particularly mackerel, are abundant in the proper seasons, but are not made an article of trade. Besides answering as the occasional food of the inhabitants, the mackerel is made use of as a bait for the cod fish, as is also the molluscous animal which inhabits the clam-shell.*

Very unsuccessful attempts were made on board the *King Fisher* to catch cod-fish, while she lay off these islands, in her trip; and had not the dried article on the shore, and the notoriety of the Magdalen Islands as a fishing station, proved the abundance of fish, we might very well have doubted the fact. We were afterwards informed, in explanation of the circumstance, that the fish leave the shallows towards the autumn and betake themselves to the deep waters, which are situated at greater distances from

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* Colonel Bouchette, who, in his recent work on Canada, has given us some information respecting these islands, describes a fish called a "*flattan*" as common to them, the length of which is about 3½ feet, and width 7 or 8 inches; this, I am informed, is the halibut, and common throughout the Gulf.

Eels and trout also are described, by this writer, as being harpooned frequently by torch light: I am doubtful as to the accuracy of the latter information, as there are no rivers on the islands, and the only fresh water traversing their surfaces is so shallow and insignificant, that a trout large enough to be transfixed with the harpoon would experience some difficulty to float.

the islands than the anchorage grounds of the vessels visiting them.

The imports, which are received in exchange for the staple commodities of the islands, are chiefly articles of consumption, tea, coffee, sugar, tobacco, rum, molasses, &c. and fishing gear, brought in schooners of from 30 to 60 tons, owned by residents at Pictou, Halifax or Quebec. About twelve of these schooners trade with the islands. The number of vessels fitted out in the Magdalen Islands as traders is about twenty-seven, and ten of these are annually engaged in the fisheries on the Labrador coast, from whence they often return with their fish green, which they dry upon the beaches.

About the middle of April the first foreign fishing vessels begin to arrive,—in the month of May they are most numerous, and they cease to arrive in October or November. Those vessels which arrive first are owned chiefly by Americans, who pay 10 per cent. to some of the residents for the privilege and trouble of drying their fish upon the beaches and flakes; and who, in consideration of this, and, perhaps, a little traffic, contraband or otherwise, welcome the return of these strangers, and are far from considering their presence as any injury to their interests. The American vessels are succeeded by others from the French settlements of Miquelon and St. Pierre, which become numerous in July and August; but even the visits of these, although their crews dry their fish on their own shores, and, consequently, pay no per centage, appear to give little or no displeasure to many of the inhabitants; a traffic, similar to that above-mentioned, and family alliances (most of the families on these islands having come originally from these French settlements, or from Acadia, with the families of

which they often intermarry in the present day) may explain this.

That these strangers illegally interfere to a considerable extent with our Magdalen fisheries is unquestionable; and it is equally unquestionable, that such interference is politically, morally and commercially injurious to the many, although a few may be benefitted by it. It has been made the subject of complaint* to the Assembly of Lower Canada; and in the Reports of the Committee for the year 1823, may be seen the information which was obtained on this subject, in particular, and on the interference of the Americans with the fisheries in the Colonies of British North America in general.†

Previously to visiting the Magdalen Islands, Mr. Ferrier, the Collector of Customs at the Port of Quebec, politely offered me the use of any information which his office might afford; and particularly directed my attention to two reports connected with a part of the duty I had to perform. These reports, one written by the late Sub-collector of the Magdalen Islands, Mr. Colbeck, the other by Mr. Bruce, of the Custom House, have afforded me considerable assistance in framing my report, both as authorities, and by directing my enquiries; and I shall now introduce here some extracts from them, with the view of shewing

* For causes which have been assigned, the inhabitants generally do not appear to sympathize in this complaint.

† Mr. Brown, of Amherst island, says, that from 90 to 100 vessels visit the islands in the season, and much the greater portion of these come from American and French ports; and Mr. Colbeck states, that 1500 non-residents are engaged in these fisheries. When leaving these islands, we fell in off Bryon Island with four French schooners from Micquelon, the crews of which, by their own account, had caught to the amount of 100 quintals of cod-fish per man, the whole probably from our fishing grounds.

the amount of exports, contrasting it at the same time with the information I received upon the spot from Mr. Cormier, one of the oldest resident merchants upon these islands, and the head of a large fishing establishment at Amherst Harbour.

MR. COLBECK.				MR. CORMIER.
This season (1830) the produce may be estimated nearly as follows:—				*(Average annually.)*
Seal oil and skins, .	£4000	0	0	Seal oil, over 100 ton, at 2s. per gallon.—7 to 8000 seal skins, at 2s. per skin.
*12000 quintals dry cod-fish, at 12s. per quintal,	7200	0	0	From 8 to 9000 quintals of cod, at 10s. per quintal,—store price 14s.
1000 quintals green fish, at 10s. per quintal,	500	0	0	
Cod-fish oil, .	300	0	0	
Cranberries, .	90	0	0	
Furs and fox skins, .	250	0	0	30 to 40 ton cod oil, at 1s. 6d. per gallon.—1000 bushels of cranberries, at 3s. 6d. per bushel.
Feathers, . .	150	0	0	
	£12,490	0	0	

Besides the foregoing, which may be considered as disposed of for the benefit of the islanders, are the following items, in the profits of which they do not appear to participate,

1000 barrels of herrings, caught by vessels from and belonging to the Bay of Fundy, at 10s. per barrel, . .	£500	0	0
14,000 barrels of herrings, caught by American vessels, at 10s. per barrel, ...	7000	0	0
	£7500	0	0

The whole amount of exports from the Magdalen Islands Mr. Colbeck computes to be a little under £20,000 currency. Mr. Cormier considers it to be between 10 and

* Colonel Bouchette states the quantity of cod-fish caught annually at 300 quintals only, but this is obviously erroneous; he does not give, also, the amount of seals by at least one half, if the above statement be correct.

£12,000, but the latter does not include the herring fishery in his estimation, as the inhabitants are not engaged in it, consequently the two estimates nearly agree. Mr. Bruce, in confirmation, observes, that "the trade carried on at the Magdalen Islands may be taken a little under Mr. Colbeck's statement."

The reason assigned why the herring fishery experiences neglect, is because there are not more than a sufficiency of hands on the islands to attend to the other more profitable branches of the same business; but as this fishery occurs in the interim between the seal and cod fisheries, there is little doubt that the islanders might follow it to their advantage were they industrious, which, however, they are accused of not being. According to Mr. Bruce, there were no less than 65 American schooners in Amherst and House Harbours this spring (1831) engaged in the herring fishery, —their places would be well supplied by British vessels.

One of the subjects of complaint in the petition to His Excellency, which will be found at the end of this report, is, that the inhabitants of the Magdalen Islands have not received the same encouragement as foreign fishing vessels, including those from other British ports, which being in a more sea-worthy trim than those from these islands, are better capable of sustaining the rough weather which is met with, particularly in the autumn, and that, in consequence, they are enabled to keep the sea, when the latter are often obliged to seek a port, and thus lose much time. This advantage is attributed to the circumstance, that the owners of favored vessels receive encouragement, in the shape of a bounty in the first instance, and a reward subsequently, in proportion to the quantity of fish caught, from their respective governments, by which they are stimulat-

ed to greater exertion, and enabled to build better vessels for the trade.

An order has been recently issued by the Board of Customs, highly favorable to the fishing interests of these islands. By this order, which has been recently confirmed by Act of Parliament, they are allowed to receive flour and salted provisions from the warehouse at Quebec, duty free; and Mr. Bruce, and other gentlemen of commercial authority, think if the same order extended to all articles necessary for the fishermen, as is the case in Nova Scotia and New Brunswick, it would prove still more beneficial in its effects.

No direct trade is as yet carried on with the West Indies, although there the produce of these islands is in much demand. Of West India merchandize is consumed, annually, here, about 50 puncheons of rum, 50 puncheons of molasses, 25 barrels of sugar, and 20 barrels of coffee; the whole of which comes principally by way of Quebec, Halifax and Pictou.

There are six stores on the Magdalen Islands, three at Amherst Island, and three at House Harbour. Articles of consumption are sold within them, at least 20 per cent. above their cost at Quebec. It has been thought that these articles are disposed of to the inhabitants at too high a price; but it should be considered, that the storekeeper advances his goods at considerable risk (and without the power of enforcing payment for them) to a needy, and often *unconscionable* debtor, nor is the former at liberty to withhold fresh supplies from the latter, because in that case his family might be reduced to the greatest distress, depending upon him probably for the means of subsistence. It is often the mortification of the storekeeper to see the

labours of the fisherman, whom he has supported through a long winter, carried to the Americans and French at the opening of the navigation. Be it also remembered, that to leave prices to the result of competition is, in general, a sound commercial axiom.

There are only two, or at most three, extensive fishing establishments on these islands; one belongs to Mr. Cormier, of Amherst Island; another to Mr. Muncey, of House Harbour, whose winter residence is at Halifax; the third belongs to an American or Americans.

Mr. Cormier, to whom I am indebted for much information on this subject and others connected with these islands, informs me that the fish are on the decrease, while the number of fishermen is increasing: the latter, however, is no proof of the former. Colonel Bouchette says, that these fisheries were described in 1821 to have been reduced to one-third of what they were fifteen or sixteen years before that period. It is thought that the French injure the fisheries much by throwing overboard, upon the fishing grounds, the heads and offals of the fish.* A good day's fishing at the present period, yields from 1500 to 2000 fish per schooner. The proportion of fish to oil is 100 quintals of the former to 60 gallons of the latter: one seal yields upon an average four gallons of oil.† The salt necessary for preserving the fish is obtained from Quebec, at the rate

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* It is not supposed that by doing so the fish are driven from their grounds by any sympathy in their nature for their species, or by their dread of a "raw head and bloody bones;" but by feeding on their own kind it is imagined that a species of atrophy is induced, which first reduces them to a skeleton and then destroys: it is also said that they choke themselves with the heads.

† Bouchette says seven.

of 13s. per hogshead, and it is used in proportion of one bushel per quintal of fish. When prepared the fish and seal oil is distributed as follows: the cod-fish is carried for the most part to Quebec, Halifax, and New Brunswick; the herrings (a very inconsiderable quantity of these are disposed of by the inhabitants) to New Brunswick, and indirectly to the West Indies; while the seal and cod oil is sent to Quebec.

Besides the establishments mentioned, some of these fisheries are, according to Bouchette, conducted on shares, which are divided among five, six, or seven men, who are employed in one vessel.

The price of labour, according to Mr. Muncey, is usually paid in kind (specie being rare), at the rate of about seven quintals of fish* per month, which is considered equivalent to nearly £5. Mr. Cormier says, however, that it varies from 3s. to 5s. per diem with food, which is much higher—it is evidently fluctuating.

The gypsum which occurs here in such abundance, is not made an article of trade by the residents, though vessels from Halifax remove it thither, where it sells at from 10s. to 11s. per ton. Red ochre of a very superior quality is also procured on these islands, from whence it is sent to Quebec.

As intimately connected with commerce, I now proceed to enter upon the subject of the revenue and evasion of its laws by the contraband traders. That smuggling has been and still is carried on to some extent in these islands, there appears to be little reason to question, although the fact of

* A quintal of fish costs 14s. store price—10s. cash.

its present existence to an amount exceeding £50 a year is denied by some of the principal residents; but as they very candidly acknowledge having been engaged in it, we cannot expect perhaps that they would admit it to be extensive, even if it were so. Both Mr. Colbeck and Mr. Bruce have expressed themselves positively on the subject, and complaints against this smuggling and upon the incapacity of the former to check it, forms the almost exclusive matter of ten pages of his reports. Since my return to Quebec, I have been informed by a mercantile gentleman that its existence to a great extent, comparatively, was admitted in his presence by one of the parties concerned. Captain Rayside, on one occasion, by boarding a French and British schooner, prevented the smuggling at the moment of a quantity of rum, but there is no doubt that upon his departure, it was landed.

Could the revenue be collected, it is thought that it might amount to £300 currency per annum; the expence of collecting it, however, would greatly exceed that sum, the consideration of which has induced the collector to recommend that the situation of sub-collector at the Magdalen Islands, vacated by the death of Mr. Colbeck, should be abolished. No revenue was collected during the time this gentleman held the office, for want of the necessary assistance, nor does it appear that his receipts were ever equal to his salary. In his report he describes the smuggling trade carried on with the islands as considerable, not only in French and American bottoms, but also by vessels either from or to all the three Provinces, Lower Canada, New Brunswick, and Nova Scotia—even Quebec, that immaculate city, is implicated in his charge, and he believed "that thirty puncheons of rum, twenty-two of molasses,

tea, tobacco, and other merchandise, to a considerable amount, were smuggled into the Magdalen Islands in the summer of 1830." Provisions, wine, brandy, coffee, cottons, shoes, &c. are among the articles introduced in this way, for which fish, oil, and sometimes cash, are exchanged.

Mr. Bruce observes in his report, "upon the supplies received from Quebec the duty is already paid. The duties might be collected on that portion which is imported by the resident merchants trading to Halifax and Miramichi, but it is very doubtful whether any at all could be obtained from the transient traders, and it appears next to impossible to prevent smuggling by the Americans and French fishermen without the aid of a large and expensive establishment;" and he further observes, that in the latter opinion he is supported by that of Capt. Walpole, of H. M. ship *Ranger*, an opinion, of the accuracy of which, any person will be convinced who casts his eye over Des Barres' chart of these islands.

It has been suggested that a coast officer would have a better chance of collecting the revenue, and of carrying into effect generally, the navigation laws for the accommodation and advantage of the trade, than an individual acting in any other capacity, and at less expence. The appearance of an armed vessel upon the coast is said to have a very beneficial effect, in many respects; and the same fear, which is said to induce many of the islanders to discharge their debts upon the approach of the *King Fisher*, would probably induce them in a great measure to desist from smuggling, were an officer afloat round the islands constantly.

I cannot better conclude this report, perhaps, than by introducing the following statement of those advantages

which, possessed by all others of His Majesty's subjects similarly situated, are as yet denied to those of the Magdalen Islands, and which to grant, will be to introduce a memorable and important epoch in their history, the favorable results of which would not be long in shewing themselves—these advantages are:

1st. The establishment of schools.

2d. The wholesome exercise of the laws.

3d. The encouragement of the fisheries.

All of which are set forth in the petition to His Excellency before alluded to, with a copy of which I now terminate this report.*

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* It may be considered somewhat surprising that the petition does not contain a word of complaint against the interference with the Magdalen fisheries by the Americans and French; the fact is, it is not felt generally by the inhabitants as a grievance, the reason of which has been given. The petition should also have contained some allusion to the uncertainty of tenure on the islands at present, with the view to get it removed; because there appears still to exist a doubt as to the right of Sir Isaac Coffin to the islands, and consequently of his agent, Mr. Doucet, to grant land upon them. For although we understand that judgments have been lately given in favor of Sir Isaac's claims, they are not considered by the other party as deciding the question. This doubt should be removed as soon as possible, either in favor of one side or the other, as its existence has an injurious tendency, by inducing the inhabitants to neglect properties in the possession of which they do not hold themselves to be secure, as well as by preventing individuals from making a permanent settlement upon the islands.

To His Excellency Matthew Lord Aylmer, K. C. B. Captain General and Commander in Chief of His Majesty's Forces in British North America, Governor of Lower Canada and its Dependencies, &c.

The Petition of the Merchants and principal Inhabitants of the Magdalen Islands, most humbly sheweth,

That your Excellency's Petitioners, in consequence of their being so remote from the seat of Government, feel to a great extent the want of a proper system of jurisdiction upon these islands, and beg leave to state that, although the trade

SECOND REPORT.

AGRICULTURAL.

READ BEFORE THE SOCIETY 21ST DECEMBER, 1821.

The soil and agricultural capabilities of any country depend upon three great causes, its geographical position, its

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of one year alone amounts to about ten thousand pounds, yet, in consequence of the said want, there is so little confidence in all mercantile transactions, and so much difficulty in the collection of debts, that it does not exceed one half of what it might amount to under proper protection, and your Excellency's Petitioners are convinced that, unless the Government be pleased to take their case into consideration, and direct such measures to be taken as may secure the interest of all concerned, no improvement can take place in this way.

Another want under which your Excellency's Petitioners labour is that of common schools; for although a few persons have paid teachers, yet the sum so raised has never been sufficient to support a competent person, and in consequence they are now without one of the greatest advantages which it would be possible for them to enjoy.

Your Excellency's Petitioners beg leave further humbly to state that, in consequence of the local position of the Magdalen Islands, they are most advantageously situated for prosecuting a very extensive fishery, yet, with surprise, they observe that vessels owned in Nova Scotia, New Brunswick, and even in the United States, St. Pierre and Miquelon, although not better manned, make better fares on the same grounds than the vessels owned in these islands, and attribute this to the encouragement which they receive from their respective Governments, which enables them to fit out their vessels superior to those of these islands, by means of which they are able to remain engaged, when the said vessels are obliged to retire to a harbour, and thus lose in the course of a season a considerable quantity of fish, and this, together with other circumstances, tends very much to depress the spirits of the fishermen, than which nothing can be more injurious to the interests of these islands.

Your Petitioners would, therefore, most humbly pray that your Excellency would be pleased to take their case into consideration, and direct such steps to

meteorological influences, and its geological formations; their consideration, consequently, should precede that of the former, to which it is at once necessary and introductory.

I. GEOGRAPHICAL POSITION.

Mr. Jones, of H. M. ship *Hussar*, places the northernmost portion of the Bird Islands in latitude 47° 50′ 28″ north, longitude 61° 12′ 53″ west; and the southernmost portion of Entry Island in 47° 16′ 7″ north, longitude 61° 47′ 26″ west.* Between these parallels of latitude, and for the most part to westward of a line joining the places of observation, lies that group of islands to which the name of Magdalen has been given.

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be taken as your Lordship in your goodness may think proper and best calculated to relieve their necessities, and your Excellency's Petitioners, as in duty bound, shall ever pray.

Here follow fifty-four signatures or marks, as many as could be conveniently collected in the time.

* As these observations form only a small portion of a series undertaken recently by order of the Admiral on the Halifax station, to determine accurately the position of several ports, &c. between that place and Quebec, they may be relied upon. They are somewhat at variance with Des Barres' charts, published in 1778; but, when we consider the improvement of astronomical instruments since that period, and particularly the introduction of the chronometer into all correct operations of this nature—that test of their accuracy and of most calculations founded upon them—we shall be rather disposed to commend its approach to correctness than to condemn its departure from it. The magnetic variation on these islands was made by Des Barres in 1778, 17° 45′ west; in 1829, Mr. Jones determined it to be 22° 25′ west; the increase westward since the former period is therefore 4° 40′.

Ships entering the Gulf of St. Lawrence, on their way to Quebec, usually pass to northward of these islands. They are situated about 180 leagues eastward of Quebec; 18 leagues north westward of Cape Breton; the same distance northward of Prince Edward's Island; 36 leagues distant from the nearest point of Newfoundland; and about 75 leagues from the French settlements of Miquelon and St. Pierre.

II. METEOROLOGICAL INFLUENCES.

The climate of the Magdalen Islands appears to differ from that of Quebec principally in the following particulars: the summers, owing to the modifying effect of the surrounding seas, are less ardent—the winters less severe; it seems, however, that the duration of these seasons at the two places is much the same, as, although the winter here breaks up earlier than at Quebec, it also commences earlier. In common with other parts of the gulf, fogs* prevail and the atmosphere is often loaded with moisture, another point of difference between it and that of the capital of Canada, where the occurrence of this phenomenon is somewhat rare. It is impossible to afford any details under this head

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* Capt. Bayfield attributes these fogs in a great measure to the coldness of the Gulf waters, which is believed to be constant a few feet below the surface as well as at great depths; every gale, by agitation, brings this cold water to the surface, which then reduces the temperature of the air below the dew point or temperature at which suspended vapours become visible and precipitated.

Capt. Bayfield and Dr. Kelly, have been engaged the last two or three summers making observations which will throw considerable light on the meteorology of the Gulf.

which shall bear upon them the impression of scientific observation, as the islands appear not hitherto to have been made the subject of it;* the following information, however, was obtained from Mr. Cormier, who, to fifteen years experience, joins the character of an intelligent observer.

In June, July, and August, the prevailing winds are from the southward of west; after August the wind is either northward or easterly. Strong gales† happen, as in other places, in the spring and autumn; also about January and February, but are not unusually common, and less so than in Nova Scotia where my informant was born. Rain is frequent in April and May, when it is sometimes accompanied by hail storms; also towards the fall of the year. Thunder storms are not common, and arise generally in the south; no instance is either recorded or remembered of injury to property or to person from the effects of lightning, which is, moreover, rare in its occurrence. No earthquakes. Ice forms in the harbours and bays in the beginning of January; its thickness is about one foot six inches; breaks up in the beginning of April. Snow about two feet deep in the woods—*verglas* common—many persons are frost bitten in the course of the winter.‡ Wild geese arrive about the 15th March. Many icebergs in the Straits of Belle Isle, even as late as last month (August 1831), but they are never seen in the vicinity of the islands.

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* It has been asserted, however, upon the authority I believe of the former Missionary of these islands, the Rev. M. Béland, that the thermometer never rises above 76°.

† During strong *continued* gales the shores exposed to them often experience a species of salt blight, which either injures or destroys the crops.

‡ The inhabitants who pursue the seal fishery in the spring, are liable to a species of chopped hands, which they call *la marine*.

My visit to the Magdalen Islands was too short to enable me to afford any original information upon their meteorology, although, under the impression that it would have been longer, both barometers and thermometers were taken; no useful or interesting inference, however, could be drawn from the few observations which were registered, and, in consequence, they have been omitted.

III. GEOLOGICAL FORMATIONS.

I now pass to the consideration of that third cause, not the least influential among them, which, totally neglected by agriculturists before the latter end of the last century, became suddenly a subject of absorbing interest among them, and forms at this day a necessary part of their knowledge.

On the agricultural condition of the Magdalen Islands, the effect of this cause is strikingly apparent; its discussion, therefore, in this place becomes peculiarly appropriate: in entering upon which, however, I shall not confine myself to that part of the subject which bears merely upon agricultural capabilities, but shall give also a somewhat detailed account of that portion of the geology and mineralogy of these islands, which my short visit to them, and imperfect knowledge of those sciences, will permit me to offer.

The first features of a country which naturally attract the eye of an observer at a distance are its hills and its mountains; and it is from their form, that the geologist may often pronounce, with considerable accuracy, upon the rock formations, &c. which characterize them long before they come within the influence of his hammer. The topo-

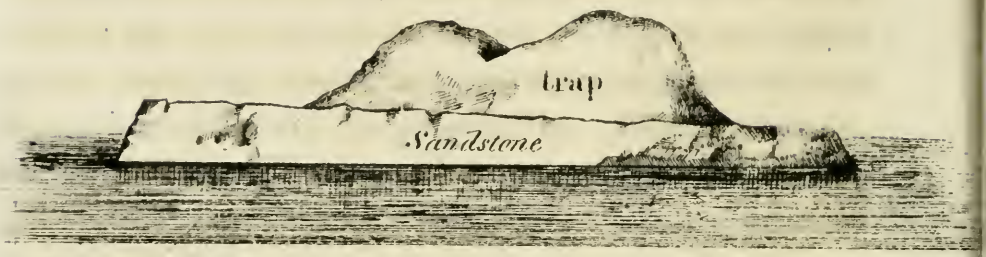
graphical* outline of the Magdalen Islands is far from not affording considerable assistance to the geological observer in this respect; and he would, we think, be disposed, upon beholding it, to suspect that its numerous conical rounded (or dome shaped) and semi-insulated projections above the horizon were owing either to accumulations of sand forming sand hills, or to that eruptive agency, which, even at this moment,† is producing similar appearances in some portions of the world; which, in remote periods, there is great reason to believe, was much more active and general, and to which geologists of the present day, almost without an exception, ascribe many of those peculiar aggregates known by the appellation of trap rocks. The appearances to which I allude, did not escape the notice of Des Barres, who, in his excellent chart of these islands, has represented the hills on them as rounded and semi-insulated. Equally characteristic as the form of the hills in the interior is the usual brick red colour of the cliffs on the shore, with their remarkable capes and headlands,—here, through the chiselling power of the waves scooped into caverns and arches,—there detached in tottering insulated and peninsulated masses, occasionally assuming grotesque forms. The upper surface of these cliffs, which in altitude above the sea varies from 20 to 120 feet, is either tabular or gently undulated, stretching away to the foot of the hills, the highest of which *may* be 400 feet.‡ Upon landing and ex-

* See Third Report.

† The recent emergence of a volcanic island in the Mediterranean will occur to most of our readers.

‡ I ascertained barometrically the height of the Demoiselle, and that of another hill in the interior of Amherst Island, to be 260 feet above the sea; the land on Entry Island is, however, more elevated.

Outline of Entry Island.



Outline of Land about Cape Wright.

amining more closely these cliffs and hills, the former are usually found to consist of sandstone, accompanied by clays and gypsum, and the latter of trap.

The outlines are introduced merely to assist the description, and, in the absence of better, they may be considered as rough geological sections, which were taken nearly at the same moment, while sailing through Pleasant Bay, towards Amherst Island, from the eastward.

The sandstones are all of them composed of the most siliceous materials, and being in general extremely friable, they yield, with considerable facility, to the abrading action of the atmosphere and of the sea. Although the prevailing colour of these sandstones and clays is a deep red, sometimes it is yellowish, greenish white, bluish white and grey. The structure of the former also is not always arenaceous; occasionally it is scaly, in which case it is usually joined to a yellowish white colour, and considerable infriability. It is doubtless to the presence of iron in these rocks, in the state of the peroxide, that their prevailing redness and friability is owing, assisted, as has been before said, by atmospheric and maritime influences, and their combined action has covered a large portion of the islands, on and towards the shores, with a deep infertile soil, of which I shall speak further, under the head of Agricultural Capabilities.

In those places where stratification is very distinct, the sandstone occurs usually in horizontal strata, but the immediate vicinity of trap rocks appears always to be characterised by displacements and conglomerations. These displacements seem to have had the effect of throwing to the surface the beds of clay and of gypsum which are frequent-

ly met with, and of redeeming for short intervals the prevailing barrenness of the soil.

The clays are usually of a red colour, sometimes bluish or greenish white; they are also stiff and indurated. The shade of red, unlike that of the sandstone, resembles more the tint communicated to earths by manganese rather than iron; they hold imbedded deposits of gypsum and red ochre. Three varieties at least of gypsum are met with,—the crystallized or selenite,—the fibrous,—and the earthy. The selenite usually occurs in hollows and druses in the earthy varieties, while the fibrous traverses the clay in seams and veins, from which they often protrude in intersecting ribs, forming a sort of network, and giving a singular appearance to the cliffs.

The colours of the gypsums vary; the selenite in thin laminæ is colourless,—in mass it is yellowish. The fibrous is snow white internally, or upon a fresh fracture; externally it is yellowish, the effect of weathering; the earthy varieties are grey, brown and blackish; they have all of them, except the selenite, occasionally a reddish tinge, which they owe evidently to their matrices.*

The fibrous varieties differ among themselves in the arrangement of their fibres, which are sometimes straight, at others contorted or curved, but always parallel to one another, and nearly at right angles to the direction of the seam or vein in which they occur. All the gypsums possess some degree of translucency, and yield to the nail; in the earthy varieties, however, the passage of light is only

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* A bright light snuff-coloured variety of gypsum, with a structure intermediate between laminar and fibrous, and very resinous lustre was also observed traversing the earthy variety in seams.

upon the edges. The earthy gypsums are met with in considerable abundance at Amherst Island, Entry Island, and at House Harbour. At the last mentioned place, where it occurs associated with clays, conglomerates and traps, there is a blackish earthy gypsum on the shore, the surface of which is studded with crystals of, as I think, a new mineral substance. (See Appendix.) In positions where rocks of gypsum, as in the above mentioned localities, are exposed to the action of the sea or its spray, they are easily distinguished by the glazed or dissolved aspect of their surfaces.

It is a question of considerable interest and difficulty in geology, whence are derived the beds of gypsum which are met with, but no satisfactory answer has yet been afforded. That sulphuric acid and lime must have been present at the time of their formation, admits, perhaps, of no dispute, but whence came the acid, or even, in this instance, the lime, as there does not appear to be any limestone whatever on the islands; nor could I, with few exceptions,* detect the presence of lime as a carbonate in any of the rocks, gypsums, or soils. Sulphuric acid, it is well known, is the product of volcanoes; it is also spontaneously formed by the decomposition of iron pyrites; obtained any way, by acting

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* The excepted instances are as follows: 1st, crystals of calcareous spar, principally of the dog tooth variety, form veins in some of the sandstones; 2d, minute rhomboidal crystals of the same mineral, either grouped together in boloyoidal clusters, resembling phrenite, and filling the pores of amigdaloidal trap, or intimately mixed with carbonate of manganese, forming a cement, by means of which the loose joints of a very rubbly trap are retarded in their separation; 3d, as a marle coloured by and intermixed with the peroxide of iron, forming a red ochre.

on the calcareous portion of either a mineral substance or animal exuviæ, a gypsum would be formed. That such has been its origin, we are far from asserting or believing; the conjecture is not without some support, however, and particularly in the present instance, derived from the presence of rocks which are supposed to have undergone the action of subterranean heat—from the fact of the occurrence on the island, of beds of iron pyrites in a decomposed and decomposing state—from the absence of marle, a deposit characterestic of this formation in other places; and from the absence or *obliteration* of all testaceous remains or impressions, which absence here, as well as elsewhere, is also characteristic of it.

The almost constant association of rock salt with gypsum, suggests, perhaps, a more reasonable supposition as to the derivation of the lime, which in the state of a muriate, forms a component part of the ocean. May not the decomposition also of the sulphates of magnesia and soda by heat furnish the sulphuric acid; conjectures which appear to have their origin with Dr. Murray, who, according to Dr. Thompson, supposes that all the constituents of sea water are muriates, except sulphate of soda; and that when the salts are concentrated by evaporation, the muriate of lime and magnesia decompose the sulphate of soda, forming sulphates of lime and magnesia.

Aware of the frequent association of rock salt with gypsum, I made many enquiries respecting the existence of any traces of a mineral, which, for fishing establishments in particular, is so much in request; but with the exception of a salt spring or two, and a few streams, the waters of which are described as brackish, particularly during the

dry season, nothing satisfactory as to its probable occurrence on these islands was heard of.*

As I did not visit any of the localities of red ochre, I cannot speak confidently respecting them, but believe they occur for the most part at Entry Island, and that it is found in crevices, seams, and veins, in the clay. W. Green, Esq.† who obtained the Gold Isis Medal from the Society of Arts, Manufactures and Commerce, for a description, (accompanied by samples of the raw and manufactured article of certain colouring materials, products of Canada,) has introduced into it a notice of this ochre, which may be seen in the first volume of the Literary and Historical Society of Quebec, page 44: with the single exception of Indian red, Mr. Green considers all the red ochres, native or artificial, as inferior to this; and its superiority to many has been acknowledged by the best judges in London.

The geological position of the sandstone he described, is undoubtedly that of the *new* red sandstone; the accompanying beds of clay and gypsum—its prevailing loose arenaceous structure—the absence of organic remains from the series—are characters which distinguish it from the *old* red sandstone, the only rock it could be mistaken for. This formation is the more deserving of notice as it has not before been recognised in Canada, with the exception of the

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* Mr. Doucet has informed me, subsequently, that there is said to be a salt lake somewhere in the interior; but there is no reason to suspect that it is accompanied by salt in a concrete state. In low portions of the island such an occurrence is to be expected, and should be attributed to a mere oozing of the sea.

† This highly talented individual, who possessed more general information upon literary and scientific subjects than perhaps any other in the colonies, died of spasmodic cholera in June last.

doubtful case of Lake Huron, the gypsums of which, like those of Niagara, are probably associated with rocks of much older date.*

The trap rocks which form the hills in the interior of these islands, and sometimes abut upon the shores in cliffs, as in the instance of the Demoiselle† at Amherst Harbour, are usually distinguished by the following mineralogical characters. Like the sandstones, they are usually of a red colour, but of a much darker shade, similar to the porphyries,* the structure of which they frequently assume. It is only externally, however, that they are red, as a cross fracture exhibits tones of grey, green, and blue; when neither porphyritic nor porous, their structure is close grained, approaching to compact, and when most so, their specific gravity is 2'6. They yield to the knife a light coloured streak; exhale generally the argillaceous odour when breathed on—sometimes they effervesce *slightly* in acid. In the interior flame of the blowpipe they usually fuse into a black globule, which is magnetic; some, however, are infusible.

The general aspect of these traps is dry, parched, and imperfectly compact, bearing in some instances a striking resemblance to fragments, the refuse of a lime-kiln; not that it is to be understood that they have a fused or glazed appearance, but as if they had been subjected to a heat below that point. This aspect, which is joined often to a

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* Either transition or the oldest of the secondary.

† A hill probably so called from its two remarkable summits which bear some resemblance in form to the breasts of a female.

‡ In a strict mineralogical sense porphyries were not seen—they probably exist, however.

texture in which ovular pores or vesicles are very frequent, causes them to resemble some recent lavas, from which I think it would not be always easy to distinguish them in hand specimens. The pores or vesicles in these traps are sometimes entirely empty, at others entirely or partially filled; in the latter case they are amigdaloidal and contain minerals, the names of all of which, it requires better specimens than I had time to collect, to determine; they are, however, *not* geolitic (as far at least as my observations have been carried as yet) being infusible, and with one exception (calcareous spar) insoluble in acid. In a sort of appendix at the end of this report, I shall give the characters of those few minerals met with, when sufficiently distinct, if uncertain of their names or provided there exists a possibility that I may have misnamed them; a method which should be generally adopted by all writers on the subject more ambitious to describe correctly and to convey *certain* information, than to display a questionable knowledge, fearing to be thought ignorant. The science is both new and difficult, and requires to be handled with hesitation and caution, particularly by persons who, like myself, can pretend to no proficiency in it; but I fear that the eye alone, and that an unpractised one, has been often made to decide questions which should have been submitted to the test of the knife, the hydrometer, the acid, and the blow-pipe. In this field of natural history, it requires but small positive knowledge to be an useful labourer, particularly in a new country, provided the proper implements of tillage be actively and judiciously employed—without them no man succeeds.

The traps are often both rubbly and conglomerated; the fragments, however, are usually angular and rhomboidal,

hanging together by their natural joints, which occasionally lying somewhat open, have in some instances admitted the infiltration or introduction into them of some foreign mineral substance. In one case, at Amherst Harbour, this substance was found to be a mixture of carbonate of lime and carbonate of manganese, which either in distinct crystals or forming an indistinct assemblage of them, like granular lime stone, filled the interstices between the natural joints of a trap, the dark purplish red colour of which, contrasts strongly with the whiteness of the carbonates. Breccias are also seen, the fragments of which, both large and small, are cemented together by the same minerals; and, indeed, fragmentary rocks and *local** conglomerates are very common on these islands.

The peculiar rounded form of the hills, wherever the trap rocks prevail, in contradistinction to the tabular or gently undulated outline of the country where the sandstones, &c. abound, has been before pointed out; so much is this the case, that if in the midst of table land a rounded mound or hill appear, which it often does, that eminence is invariably found to be composed of trap; several of these insulated mounds or hills are seen on Amherst Island.

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* By *local* conglomerates I mean such fragmentary aggregates as are composed of the broken or abraded materials of older deposits in the immediate vicinity. Both soils and rocks have an untravelled aspect in general, and I do not remember to have seen a single large boulder on the islands. Towards the East Point, beyond Entry Harbour, we met with an accumulation of ovular water-washed pieces of a reddish sienite, not exceeding a foot in length, and evidently thrown up upon the beach by the violence of the breakers. On the shore, not far to northward of this place, there is a shallow lake, shewn in Des Barres' charts, which although now inaccessible, is said formerly to have admitted vessels of some burthen.

It has been also before remarked, that the position of the sandstone, when apparently undisturbed, is horizontal; but that in contact with trap rocks they seem to have suffered a displacement, by means of which their strata are made to dip considerably; this may be seen at the eastern foot of the Demoiselle at Amherst Harbour, and its converse is best observed on Bryon Island, one of the Magdalens, where no trap rocks occur, and where the sandstone is in distinct nearly horizontal strata from one end of the island to the other—a fact well deserving attention.*

There is another feature which appears to characterize these trap rocks, at least at House Harbour; it consists of certain crater-shaped hollows which are met with; I counted four of these in the space of a few acres surrounding Mr. Colbeck's house, and was informed they are frequently to be met with in the interior, particularly on Grosse Isle, where trap, I believe, abounds, and no gypsum occurs.

My leaning towards the igneous hypothesis, must not induce me to withhold the information that these hollows are said to be characteristic of places where gypsum is found in abundance, and particularly of its localities in Nova Scotia; a circumstance which may be explained by supposing that the deposits of salt which so frequently accompany gypsum, have, in such instances, been dissolved

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* Since writing these Reports, I have perused the "Mineralogy and Geology of Nova Scotia," by Messrs. Jackson and Alger, by which work it appears, that the formations so characteristic of the Magdalen Islands predominate in that division of British North America. These gentlemen, however, describe the new red sandstone there met with, as always underlying the trap, whereas, that here alluded to, seemed to be always uppermost.

and the pits they occupied, left vacant. This explanation seems extremely plausible, when these hollows are situated in gypsum, or in clay, and to the operation of such a cause may be attributed several well or bath-shaped concavities in gypsum which are also seen in the neighbourhood; but those hollows I particularly allude to at present, are much larger, of the form of the reversed frustrum of a cone, and situated in trap, in which salt, I believe, has never been observed, and into which gypsum may enter in seams, but never in masses. That salt should not have been noticed in trap rocks is, I think, rather remarkable, as it is precisely in such rocks, or at all events in such as have been subjected to heat, that this mineral might be expected to occur. The theory is this: by the aid of subterranean heat, rocks are thrown above the level of the sea—their cavities, perhaps, contain sea water—by the agency of the same heat the water is evaporated, and beds of salt formed. In the crater of an extinct volcano, near Burgos, in Spain, salt has been noticed; also in a volcanic mountain in Sicily; but I am acquainted with no instance of its occurrence in rocks, which can be classed under the head of traps. Some of the traps contain small nests of specular iron; and the same mineral was met with in some profusion eastward of Amherst Harbour, where, intermixed with either iserine or titaniferous oxide of iron, it forms an alluvial deposit on the sides of a small stream, descending a clayey cliff, not far from the eastern foot of the Demoiselle. In a small bay near this spot, a fine chalybeate spring was noticed jetting out of the ground.

Magnetic sand, in some abundance, forms a loose horizontal stratum on the eastern shore of Bryon Island, and in one of its numerous small bays situated near the northern

extremity. It consists of black glistening particles, of a rounded form, like grains of coarse gunpowder, mixed with ruby and amethystine coloured grains, either translucent or semi-transparent, and white quartz. The black magnetic particles appear to be iserine—the ruby coloured grains may be spinelles, zurcons, or simply garnets; but they are too small to admit of easy examination in order to determine these points—an objection common to all sands, and a circumstance to be regretted, as otherwise the mineralogy and geology of a country might be often very nearly determined by the inspection of a mere handful of sand; at least, in cases like most of those which apply to the Magdalen Islands, in which the sands are composed of the abraded particles of rocks in *situ*.

The only mineral characteristic of amigdaloidal trap which could be recognised is green earth, which fills some of the pores of that rock on these islands; nor have we here any more facts of either a geological* or mineralogical nature to communicate; a deficiency which must be attributed to our short visit and little acquaintance with such subjects, rather than to a dearth of materials for observation; as I feel confident, that a leisurely tour round these islands, would afford the geologist considerable amusement, and the public interesting information.

In taking leave of the trap† rocks, I will sum up thee vi-

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* See my third report.

† In my report on the geognosy of the Saguenay country, inserted in the first vol. of the Transactions of the Literary and Historical Society of Quebec, I have called the predominating rock there met with, a trap; but it differs essentially, both mineralogically and geologically, from the one here alluded to—the former is probably primary, the latter is undoubtedly secondary—the first is prin-

dence upon which is mainly built their igneous origin: first, the form of hills they compose; second, their porphyritic, amigdaloidal, vesicular, or lava-like structure; third, the geological influences they appear to have exerted upon the accompanying sandstones, clays, &c. shewn in their displacement, in their redness, and even in their friability.

To conclude, it may be permitted to offer an opinion as to how these islands were formed—it is given allegorically.

Neptune, *warmly* pressed by Vulcan, conceded, in remote ages, these, at that period, submarine territories, into the hands of the latter, who lifted them from their marine abyss to excite, at once, the caution, curiosity, and commercial speculations of the future navigators of the Gulf. Tired of possession, he has long since abondoned them to the effect of atmospheric and maritime influences; in consequence of which, they are now gradually returning under the dominion of their former monarch, and Neptune is recovering in detail what he surrendered in the gross.*

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cipally composed of a very crystalline hornblende, and from the easy fusibility of the second into a black magnetic globule, it is, probably, also amphibolic; but with the exception of its fragments, which are usually rhomboidal, it possesses very little of a crystalline structure—however, a common origin for both, at very distinct epochs, is a reasonable conjecture.

* Not exactly, but correct enough for an allegory. This sort of wear and tear has a tendency to destroy itself, by accumulating at the foot of the cliffs a barrier of loose materials, against which the waves dash themselves in vain attempts to resume, *permanently*, their former dominion over them; and the fact is, that the disintegrating agents at this moment in action around these islands, are rapidly adding to their extent by diminishing their height; and it may be said, metaphorically, that this *malleability* is given to the friable rocks by the beating of the waves, the rushing of the currents, and the sweeping of the winds.

IV. AGRICULTURAL CAPABILITIES.

Having touched upon the three principal causes by which the agricultural characters of countries in general, and the Magdalen Islands in particular, have been influenced, I proceed to describe the actual state of the soil resulting from their combined operations.

It has been already stated that, owing to the great predominancy on and towards the shores of the very friable and siliceous sandstone described, the soil covering it is, in most places, composed of little besides its abraded particles. Above a deep deposit of these, remarkable, like the rock beneath, for intensity of colour, a thin stratum of a very fine siliceous earth,* of a chalky whiteness, is observed; and above this occurs a thin brown covering, principally composed of the fibres and roots of grass, whose lively green surface, notwithstanding its meagre sustenance, supports, in some instances, a few head of well favored cattle, particularly sheep, which vie in appearance with our Hampshire South Down: a thin black soil, the result of vegetable decomposition, also occurs here and there. The uplands or hills have no sandy deposit whatever upon them, but appear all to be composed, to within an inch or two of their surfaces, of trap rocks. Some of these hills are covered with trees, principally the spruce fir, while others are bare of them to the summit, and afford (particularly in the vallies between) fine pasturages for cattle,

* When I first saw this earth, it struck me that it might be a powdered gypsum, nor am I yet certain that that mineral is not mixed with it: it is too soft for pure silex, and yet certainly contains no lime in the state of a carbonate.

the scarcity of which surprised me; but no branch of farming has hitherto experienced a fair trial on these islands, as all the inhabitants are more or less engaged in the fisheries, for the convenience of attending which, they reside near or on the shores, and precisely in those places where the worst soils prevail. Although the foregoing description is grounded principally upon a visit to Amherst Island, it will apply *essentially*, more or less, to all these islands; in casting our eyes over which, one fact is strikingly obvious, viz. that in few places can the soil be disturbed; the plough, that useful implement of husbandry elsewhere, can here rarely be employed—irredeemable barrenness would follow in its track, the materials of which exist a few inches below the surface; in the vallies and plains they are ferruginous and siliceous sands;* on the hill tops and sides they are rocks.†

On the western side of House Harbour, the land is, for a short interval, of a better description than that generally met with, which may be accounted for by the fact that clays, gypsums, and trap rocks there abound, to the *exclusion* of the sandstone.

The soil of Entry Island is *described* (for I did not see it) as being still superior, yielding very fine crops of wild grass, which support a few head of cattle in the finest condition:

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* The red marle, or new red sandstone formation, which is unquestionably the one which characterizes the Magdalen Islands, is, in England, remarkable for the fertility of its accompanying soils; but, to explain this apparent anomaly, it must be stated, that the marly beds to which those soils are indebted for their fertility, have not been observed in the formation in question.

† Trap rocks, in a state of decomposition, often furnish good soil; but, as in the present instance, they do not always yield easily to the action of weathering.

the flesh of an ox from hence we tasted, was found to excel in flavor any we had before met with in Canada.

The north eastern portion of Coffin Island, beyond Grand Entry Harbour, is reported to be extremely unproductive, low, and swampy, and our own observations, as far as they extend, are in confirmation. Des Barres' chart represents the land alluded to, as being a low flat, of a circular form, with several small lakes, probably of brackish water. Upon landing on its southernmost shore, in Grand Entry Bay, we found cliffs of red sandstone, and ridges of sand, covered by a thick matting of juniper in some places, and by a meagre grass in others.

The soil of Bryon Island is better than that usually met with in other portions of the group; it is, however, light and sandy; it also possesses an outline more favorable to agriculture, being nearly parallel to the horizon. The island is girted round by cliffs of red sandstone, which on the eastern side, do not attain a greater elevation than twenty feet, while on the western, it usually amounts to fifty; the land dips away from the latter towards the former, and bears more analogy to a writing desk than a table. Its most elevated parts are free from trees, but are covered with a thick crop of wild grass, which would support a hundred head of cattle during the summer season; the opposite, or eastern side, is covered with a dense thicket of stunted timber, principally spruce fir: cranberries abound here. Little appears to be known of the Bird Islands, beyond the facts, that they consist of high cliffs, having summits of a tabular form, partly covered with the dung of birds, which looks at a distance like a mantle of snow: the eggs of these birds are collected for food by the fishermen.

Although called islands, they are, in fact, mere islet rocks, and occupy the northernmost position in the group.

All my enquiries and observations tend to satisfy me, that, with few exceptions, the Magdalen Islands offer no inducement for the farmer to settle upon, as there is only one branch of his business which he could hope to follow with any tolerable success, viz. grazing; and even that is doubtful, as all the expences of keeping the cattle through a long winter, and exporting them to a distant market, (there being no demand for them within the circle of the islands,) must be incurred.

The grazing of cattle, the stacking of wild hay, the raising of potatoes, cabbages, and a few pot herbs, is the extent to which farming has been hitherto carried on in these islands; nor is this state of things likely soon to experience a change, for, as long as the interior remains uninhabited, (and that will be the case while fishing is a more lucrative occupation than farming,) no alteration is to be expected.

It is useless to enter into the consideration of how much an improved system of tillage might ameliorate the soils—what benefit they might derive from the judicious intermixture among them of the gypsums and clays met with—the bare thought of such a mode of improvement would frighten the Canadian settler, and indeed, I fear, in the present instance, it could not be generally adopted.

There exists a doubt in England, whether gypsum, employed as a manure, is of any service to the soil.* In the

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* In the instructive and detailed account of the mineralogy and geology of Nova Scotia, by Messrs. Jackson and Alger, recently published, it is observed, page 64, that the native gypsum does not in the least appear to add to the fertility of the soil, but rather the contrary.

United States, it is largely employed, and held in high estimation generally. Sir Humphrey Davy remarks, in his "Agricultural Chemistry," that "the reason why gypsum is not generally efficacious, is, probably, because most cultivated soils contain it in sufficient quantity for the use of the grasses." He is of opinion, further, that its action on soils is neither to be explained by supposing it to render them more absorbent, nor by assisting the putrefactive process; but he does not explain in what the action does consist.

The timber on the islands is, for the most part, pine (spruce), birch (black), and juniper; the inhabitants procure it of sufficient size to build and mast their small vessels. Juniper berries, strawberries, raspberries, and cranberries, are among their wild indigenous fruits.

The *myrica Carolinensis*, or broad leaved wax-tree of Carolina, is met with, I believe, in some abundance on the Magdalen Islands, where it has been already converted into a vegetable tallow or wax, by some of the inhabitants.

Their sandy soils, their maritime position,* are circumstances favoring its growth; and it appears probable, that the cultivation of it on them generally, might be successfully pursued. It is a shrub that yields, when most productive, about seven pounds of berries, which, by infusion in boiling water, give twenty-eight ounces of wax: it is considered a very valuable vegetable production, and one which might become of commercial importance. There is an article in the first vol. of the Transactions of the Lite-

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* According to Mr. Sheppard, of Woodfield, it grows naturally in no other: it is said to have been noticed as high up the river as Hare Island.

rary and Historical Society of Quebec, page 231, which affords some valuable information upon plants of this genus. The Gardener's Magazine, vol. i. page 403, may also be consulted on the subject; and Mr. Sheppard, so well known to all of us by his valuable botanical contributions, has inserted a notice of this shrub, at page 64, of the second vol. of the before-named Transactions, just published.

On the subject of the concession of land on these islands, I received the following information from Mr. Doucet, the agent employed by Admiral Sir Isaac Coffin, to whom a grant of them was made in 1797.

Sir Isaac made no endeavour to obtain rent until 1806, in the summer of which year, he passed two months on the islands, and was generally acknowledged their proprietor. On this occasion, an arrangement was made with the inhabitants, to pay at the rate of twenty shillings currency, or two quintals of fish yearly, in perpetuity, for every lot; which rent was paid regularly until 1816, at which time they discontinued payment, on grounds upon which has been founded, subsequently, a legal question; but judgments have been obtained already in it, in favor of the Admiral's claims, although an appeal to a higher court still lies with the other party.*

No rent has been received up to the present period, since 1816; but Mr. Doucet has made arrangements to grant land, in perpetuity, or otherwise, according to the wishes of the grantee, at the rate of from 10s. to 30s. per lot, depending upon its extent, quality, and locality.

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* The importance of having this question set at rest finally, has been pointed out in my first Report.

No very precise method has hitherto been adopted in describing the boundaries of the different lots conceded, in consequence of the want of a land survey (that on which Des Barres' chart is constructed having been a coast survey), the custom having been to lie them entirely out by the eye, the evil of which is not felt at the present day; but, as these islands become settled, it will increase, and may give, ultimately, if persevered in, a great opening to litigation. Mr. Doucet intends to make immediate application to Sir Isaac, to obtain his permission that the islands, at least the inhabited portions, should be regularly surveyed; it being the wish of the islanders, who, in that case, have agreed to become rentees.

Statistical table of the Magdalen Islands, taken from Bouchette.

Horses	100
Cows	316
Sheep	550
Swine	360
Home made Cloth . . .	1275 yards.

Some fowls and other poultry.

It is said that no reptile has hitherto been seen upon these islands, a fact which their sandy soils and detached position may account for.

MINERALOGICAL APPENDIX.

Mineralogical character of some of the minerals met with on the Magdalen Islands.

The mineral which occurs, studding the surface of the gypsum, at House Harbour, possesses the following characters.

It is crystallized in small dodecahedrons, the faces of which are triangles, (scalene?) or its form is that of two six-sided pyramids joined base to base. It cleaves, in smooth polished planes which yield readily to division, parallel to the common base of the pyramids, which appears to be oblique to their axes; it may have other cleavages, but they were not seen. The colour is hair brown or brownish. It is semi-transparent, or rather the crystal, otherwise transparent, appears to contain a nucleus of some dark opaque substance. It yields readily to the knife; and its specific gravity appears to be that of an earthy mineral, about 2'6. It is insoluble in the mineral acids, even when assisted by heat, by exposure to which, it immediately becomes black, opaque, and magnetic; if the heat be continued, a pavonine tarnish, such as is often perceived on steel, is observed; but it is infusible at the highest temperature of the blowpipe. With borax, it fuses easily into a transparent glass, which is yellowish while hot, and greenish or bluish when cold.

I am inclined to think this is a new mineral, as I can find no mineral, the description of whose character agrees with it.

Carbonate of Manganese.

This mineral occurs in small, but distinct, white translucent crystals, of a rhomboidal form; also in masses, composed of the assemblage of such crystals, but smaller and less distinct. It yields easily to the knife—is soluble in cold muriatic acid with effervescence—specific gravity of mass 2'7·8—turns brownish black in the exterior flame of the blowpipe, but not magnetic—infusible in the interior flame. With borax it forms, with considerable effervescence, a glass of an *amethystine hue.* This specific gravity of this mineral, in *mass*, is low for carbonate of manganese; but this I attribute to the circumstance, that carbonate of lime, under the form of calcareous spar, is probably mixed with it.

Its position has been already described, and it appears to occur in some abundance. When first observed, it was mistaken for one of the white zeolites, in consequence, chiefly, of its association with trap.

From the crevices and natural joints of a trap rock on the shore of House Harbour, is taken a mineral, in close association with crystals of ferruginous quartz, of which, the following are some of its characters.

Colour yellowish, white, or greenish,—translucent to semi-transparent—structure confusedly laminar and crystalline, generally; but some tolerably distinct crystals, of a rhomboidal form, were observed. It *appears* almost to pass into the substance of the quartz, with which it is associated, and from which it is sometimes with difficulty distinguished

by the eye alone; the lustre on the faces of the laminæ is shining, and somewhat pearly—yields to the knife easily—specific gravity about 2·7—insoluble, or very slowly soluble, in cold muriatic acid, although a slight effervescence is at first perceived. When the acid is heated, the mineral dissolves rather rapidly, with increased effervescence. It turns brown and friable before the blowpipe; but does not fuse nor burn to lime. With borax, it fuses with violent intumescence into a transparent glass, which is yellowish when hot, and colourless when cold. No phosphorescence—no magnetism.

I am much at a loss what to call this mineral; it seems to agree best with either phosphate of lime, or pearl spar, but differs essentially from both.

The quartz crystals it is associated with, are low hexagonal prisms, terminated by six-sided pyramids; they have a ferruginous coating, through which, when held to the light, they appear of a blood red colour. When this coating is removed by an acid, in which it scales off, the crystals are colourless and transparent.

In some specimens of porphyritic and amigdaloidal trap, collected on the shores of Amherst Island, and evidently detached from rocks, in *situ*, in the vicinity, were observed two distinct minerals, one red, the other green.

The red mineral occurs in small rhomboidal shaped crystals, of an indistinctly laminar structure and low lustre—opaque or nearly so—yields to the knife a white streak—insoluble in the mineral acids—infusible. It bears a resemblance to flesh coloured felspar; but wants its fusibility and

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Outline of Des Barres Chart of the Magdalen Islands:
Published in 1778.
The Geological Notes affixed in 1832.
Printed from Stone by Lamm & C°. Montreal.
Little Bird Island
Great Bird Island
Bryons Island
The Red Sand Bank
North Cape
North East Point
North Cape Rock
Great Entry Rocks
Old Harry
Wolfe Point
Great Entry Bay
Shagg Island
Cape Wright
L'opital
Alnehi Island
Inhabited by Indians
Geological features of
House Harbour
Etang du Nord
North West Cape
Grindstone Island
Cape Grindstone
Similar to those of
Seal Id.
Le Chourie
Great Entry Harbour
Sandy Hook
Island
Deadmans Island
Etang d'Ouest
Red sandstone gypsum
Stays covered by the Sea
generally from the Shore
Basin
Amherst Island
rounded hills of Secondary
Sea Cow Rocks
South West Point
Statute Miles
Nautical Miles

hardness. It is these crystals which give the porphyritic structure to the mass.

Green Earth.

The green mineral which fills the cavities of the amigdaloidal, consists of a fine soft earthy substance, yeilding to the nail, and having sometimes a silky lustre and fibrous appearance, which I attribute to the action of weathering. It is insoluble in acid, and infusible.

THIRD REPORT.

TOPOGRAPHICAL.

READ BEFORE THE SOCIETY 21ST JANUARY, 1832.

A topographical description of the Magdalen Islands has been anticipated, in some measure, by the information which has been already given, respecting their agricultural capabilities and geological formations, and, indeed, it is at all times impossible to enter upon the discussion of one of these subjects without making some allusion to the others. I shall, however, avoid repeating as much as possible the same remarks, and only do so in instances in which convenience will excuse tautology.

The Magdalen Islands, with four exceptions,* form an

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* The Bird Islands, Bryon Island, Entry Island, and Deadman's Island are the exceptions; other detached portions are mere islets, as, indeed, are the first and last of these.

almost continuous chain of land, about forty-two miles in length, and directed nearly N. E., S. W. This chain embraces all that is either politically or commercially of importance in the group, an advantage it is ever likely to retain, as long, at least, as its harbours remain open;* a maritime feature in which all other portions of the cluster are deficient.

The first, or southernmost portion of this chain, is Amherst Island; the second, in northerly succession, is Grindstone Island; the third, Alright Island; the fourth, that vermicular line of coast which, first stretching away to the north-eastward as far as the "north-east" point, suddenly rounds to the westward, forming Coffin's Island and Grosse Isle, then returning, on a nearly parallel course, encloses that singular interlockage of water, having Grand Entry Harbour at its north-eastern extremity, and Haywood and House Harbours at its south-western. Between Amherst Island and Grindstone Island there is a similar water interlockage, called Havre Basque, but, unlike the others, quite inaccessible to vessels.†

This chain, which may be considered as forming one island, into which the sea has made deep longitudinal inroads, (a remark substantially, though not positively, correct, as that element has probably thrown up the sand banks which now enclose it,) presents, on its eastern side, an outline of coast on which the flow of the tides, and the

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* There is reason to suppose that they are gradually closing.

† These natural canals may be considered the *links* by which the chain is united: in process of time these links will become filled up by the drifting in of sand, and what now, in plan, resembles a double chain shot, will then bear more analogy to shot united by a double bar.

beating of the waves, &c. have, as was to be expected, produced a much more sensible effect than on the opposite coast, which, instead of being, like the former, characterised by bays and harbours, is deficient in them almost altogether; a fact sufficiently obvious as regards the whole chain, but peculiarly so, if the eye be confined to a latitude southward of Cape Alright.*

First, in point of present importance in this chain, is Amherst Island, the form and size of which would be nearly that of an oval, having about 5½ and 3½ miles for its axis, (the former nearly east and west) were it not for a narrow isthmus and peninsula, the former of which, stretching to eastward, connects the main land with the latter, in which is situated the only harbour on the island. As this harbour is the best which is settled in the group, it becomes necessary to give a particular description of it, and of the surrounding country. The isthmus alluded to is caused by a *bight* of water, called Basin Bay,† which, encroaching on the southern shore of the island, forms a species of salt water lake, which nearly washes the foot of the "Demoiselle," a remarkable insulated hill, 260 feet in altitude above the sea,‡ from the summit of which a fine commanding view may be obtained over the whole of the harbour, about 6000 feet to eastward, and of the anchorage ground in Pleasant Bay, about the same distance; while the only road into the

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* It is worthy of remark, that the clays and gypsums on the islands are met with, principally, if not entirely, to the southward of the same place, and on the same shore. Observe that clay is readily diffused through water, and that gypsum is soluble in 460 parts of that element.

† Some of the oldest inhabitants on Amherst Island remember of seeing in this bay vessels drawing 15 feet water,—it is now inaccessible to boats.

‡ Barometrically measured.

interior (following the direction of the isthmus) crosses the side of the Demoiselle, near its southern and south-western base. This isthmus is about three miles in length, and half a mile wide; it leads from Amherst Harbour to the settlements* on the north-west shore, distant about seven miles.

Amherst Harbour is bounded on the west, south, and south-east by the peninsula before-mentioned, which, making a sudden turn to the north-east, terminates about four miles from the harbour, in that low sandy pit called "Sandy Hook." The channel into the harbour runs nearly parallel with this shore, at the distance of about 600 or 700 feet. The land, by falling away from the summit of the Demoiselle towards the harbour, secures it to the north-westward, while an arm of rock, elbowing into the sea, completes its circle of security to the northward. This arm,† or natural mole, has a variable altitude above the sea of from 30 to 60 feet, its length is about 2000 feet, and greatest breadth 450; its precipitous cliffs on the shore are surrounded by a narrow belt of sand, except in a few prominent parts where the sea washes their bases. The widest and highest portion of this arm is about the centre, from whence it falls away, both in height and width, towards the north-eastern extremity, where these dimensions are

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* I measured with the barometer the height of a bald hill, immediately overlooking these settlements, and found it to agree nearly with that of the Demoiselle; another hill to north-westward was judged to exceed it by 20 or 30 feet, but certainly did not exceed 300 feet of altitude above the sea, and is probably the highest land in the *chain*. The highest land on Entry Island may be 400 feet, the loftiest in the group.

† Its shape is like that of the human arm: formerly it was an islet, indeed it is represented as such in Des Barres' chart, published in 1778; it is now joined to the peninsula by a sand bank.

30 and 100 feet respectively. The opposite, or south-eastern, side of the harbour, distant from this end of the mole about 1000 feet, is in general a low sandy ridge, with a few small insulated hills,* of a conical form, upon it; one of the nearest of these hills was found to be about 5000 feet from the mole. The rest of the country not described, immediately surrounding the harbour, is low and slightly undulated, with here and there a few scattered circular mounds; precipitous cliffs, however, are gradually formed on the shores as the foot of the Demoiselle is approached.

The entrance into the harbour is narrow, but straight, and vessels drawing from 11 to 12 feet water readily enter at high tide, and become secure against every wind; should they shake, which often happens, they can receive no injury, the bottom being a soft ooze. The channel runs about 300 feet from the south-eastern extremity of the mole.

It must not be understood, that all portions of the watery expanse within the mole will receive vessels drawing 11 feet water, as much the largest half is only fit to receive boats. No vessel must pass to northward or north-westward of the prolongation of a somewhat remarkable digilated sand spit, which will be noticed upon the right hand on passing within the mole. The rectangular space southward of this line of prolongation, although small, will hold sixty small craft at a time, and that number has been seen within the harbour more than once.† Secure against all

* I have no doubt that these hills are composed of trap; but they were not visited.

† Amherst Harbour, however, appears to be fast experiencing the fate of Basin Bay; even within the last twenty years its entrance is said to have been narrowed at least as many feet.

winds, vessels could ride at anchor in four or five fathom water outside the mole.*

Amherst Island is connected with Grindstone Island by almost continuous spits of sand,† which enclose between

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* Mr. Cormier is of this opinion, but both Captain Bayfield and Captain Douglas think that a gale from the N. E. is to be dreaded. With deference to such good authority, however, the local experience of the first named gentleman gained during, I believe, a period of twenty-five or thirty years, carries with it much weight, and who, in advancing so opposite an opinion, assigns as a cause for the fact, that storms are not to be dreaded, the gradual shoaling of the water from shore, by which the waves are deprived of their force before they reach the anchorage ground; and this remark applies to the whole of Pleasant Bay. The two following facts are corroborative; first, wrecks, although common enough on other portions of the coast of this chain, never occur, or rather never have occurred, to my knowledge in this bay; the second fact, equally cogent, is, that no boulders of a large size, and, indeed, very few of a small description, are seen on the shores of Pleasant Bay, and rarely any other fragments of rock than such angular pieces as have been detached evidently from formations *in situ;* this is the more remarkable, because some of the islands met with in a passage to the Magdalen Islands have their shores crowded with foreign debris; Green Island for instance, where some of the boulders are of enormous size.

† These spits of sand are evidently recent formations, increasing daily, and were originally produced by the influence of the rocky islands upon the tidal waters and currents bearing with them their sedimentary deposits. It appears farther probable, that the bars or spits of land to westward were formed first by the *direct* force of the waves, and subsequently those to eastward by the recoil or back-water. The original rocky islands are boldly scarped, but the new creations are low and shelving. The eastern shore, from the northern extremity of Amherst Island to Grindstone Island, is one unvaried strip of the finest and smoothest sand, over which the waves gently ripple at the very moment they are in other places on this coast foaming against the rocky capes. Nothing occurs to relieve the quiet monotony of the scene but the half buried exuviæ of the crab, the lobster, or of some of the molluscous tribe of animals, among the genera of which the *natua* and *solen* are most common: it is worthy of notice, that shells of the same species with those found in such abundance in the loose arenaceous formation on the left bank of the Beauport River are met with here and in other

them a shallow salt water lake, called Havre Basque, now (whatever it may have been) inaccessible to vessels; and it has been already observed that this feature is analogous to what is noticed between Grindstone Island and Coffin's Island, with this essential difference, however, that the lake in the latter instance is terminated at each extremity by a harbour, which *is* accessible to vessels. The southernmost of these harbours, or that situated between Grindstone and Cape Alright, to which the name of House Harbour has been given, is the one to which I am now about to direct my attention, as it claims precedence of Grand Entry Harbour, by being more central, by being settled, and by being at the present moment the resort of vessels.

House Harbour is situated nearly due north of Amherst Harbour, from which it is distant about twelve miles by water, and twenty by land. It lies between the hilly islands of Grindstone and Alright; the former and Amherst Island secure it, and the anchorage in the bay outside, from all winds from south to west, while the latter offers an equally secure cover against winds from the north and eastward. The entrance into this harbour lies open to the south eastward, with the exception, that the land of Entry Island, the most elevated in the group, and distant about nine or ten miles, assists in modifying the force of the waves and winds from this quarter of the compass, and, in co-operation with the

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places in the Gulf. This formation is worthy of notice, and in a small pamphlet on the Organic Remains of Canada, compiled in the spring of 1828, to assist by its sale the funds of the Orphan's Asylum of Quebec, I introduced, in a note at the last page, some account of it, the only one hitherto published. But as this account is meagre, and I think the subject sufficiently interesting, it will probably form a separate article, to be submitted to the Society on some future occasion.

cause before mentioned, occasions gales from the south-east to be little dreaded by vessels in the bay.* Within the harbour they are not felt, owing to a spit of sand, or natural wharf, which, terminating at Grindstone Island, to northward on its sea board, forms on that side a sort of low terrace to the harbour at its entrance across, while a shoal also contributes towards the same effect; an advantage, however, which is more than counterbalanced by its not permitting vessels drawing over nine feet water to pass, on which account, and its not being so capacious, House Harbour is inferior to Amherst Harbour.

This harbour is commanded on the Cape Grindstone side by cliffs of from 20 to 100 feet in altitude, but the immediate shore on the opposite side is a low sandy beach, stretching away to the foot of a hill, in one level of about 400 feet or upwards. The land about Cape Alright is rather elevated, and abuts in precipitous cliffs (perhaps 50 feet in height) upon the shore, but as the harbour is approached, these cliffs are succeeded by the low sandy flat before-mentioned. Within the harbour, there are two or three small islets; the most remarkable of these (the others being mere sand banks) is one composed of red sandstone, whence the name of Red Island, having a natural scarp of about 30 feet in height all around it. It is long in proportion to its width, which, I believe, in no place exceeds 100 feet, and the channel passes longitudinally, close to it on its south-western side. However, as I did not land upon this islet, I cannot write positively concerning it.

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* I have already elsewhere observed that Captain Bayfield and Captain Douglas are not of this opinion.

The form of Grindstone Island approaches that of the circle, whose diameter is about five miles, while that of Alright is irregularly elongated to the north-eastward, the greatest breadth, measured from Cape Alright westward, being about three miles, and length north-eastward about nine. Like most of these islands, they are hilly, and the hills are woody and cone-shaped, or rounded towards the interior; bare and tabular towards the coast.

Although the regular direction of this chain is N.E; S.W. that part of it embraced by Amherst Island points more northerly. The land beyond Grindstone Island, rounds suddenly to the eastward, and forming the south-easterly portion of Alright Island and shore of House Harbour Bay, subsequently bends north easterly, in a moderately concave line, as far as Grand Entry Harbour, distant about twenty miles from House Harbour.

No settlement has yet been effected on the shores of Grand Entry Harbour and Bay; a circumstance which the reputed infertility of soil will not account for, among a people whose occupations are almost exclusively maritime. Equally secure as are the two other harbours, against all winds, it much surpasses them in the number and size of the vessels it will receive. Brigs drawing from fourteen to fifteen feet water, may enter this harbour at high tide,* and anchor there in perfect security; the channel, however, is somewhat intricate, and would require buoying. The entrance is formed by two spits of sand, about six or eight hundred feet asunder, through which a strong current

* High tide is usually about four feet above low water—spring tides from six to eight.

passes as the tide lowers. Two or three miles to northward, within these spits, is situated the centre of the harbour, the water of which, continues to deepen from three to six fathoms, as the base of an elevated hill, with two rounded summits, is approached.

Beyond Grand Entry Harbour, the land again bulges suddenly to the eastward, enclosing Grand Entry Bay to south-eastward, and forming capes like Cape Alright, but not so elevated. After doubling these capes, the outline of the shore bends once more north-easterly, and terminates in that low rounded flat to which the name of Coffin's Island is affixed. This portion of chain is described to consist of a sandy alluvium, full of small lakes or ponds of brackish water. On the contrary, Grosse Isle, a portion of which forms the hilly back ground in Grand Entry Harbour before alluded to, is composed of rocky eminences, which, like those on Amherst Island, Grindstone Island, and Alright Island, were formerly groups, distinctly insulated, but whose insularity, in the present day, is almost (and will eventually be quite) destroyed, by those daily accumulations of sand before alluded to, which are gradually cementing these islands together by two broad barren bands.

As regards the other islands of the cluster, forming no part of the chain to which the foregoing observations bear particular allusion, I have merely to point out their relative position, form, and size; all other information which I possess respecting them, having been already given in my second report.

The Bird Islands, or rather islets, are situated in the prolongation of the chain to the north-eastward, from the most easterly portion of which, they are distant about eighteen miles: they are two in number, and mere rocks,

elevated from fifty to one hundred feet above the sea. The northernmost is placed, by Mr. Jones, of His Majesty's ship *Hussar*, in longitude 61° 12′ 53″ west, latitude 47° 50′ 28″ north.

Bryon Island is ten or twelve miles northward of the north-eastern extremity of the chain, its latitude is 47° 48′ 8″ at the north-east point, (Mr. Jones,) from which it extends south-easterly from three to five miles: its breadth being about half a mile.

Entry Island, occupying the most south-easterly portion of the group, is, in form, nearly a circle, whose diameter is about two miles. It is ten miles from House Harbour, and six or eight miles from Amherst Harbour. Between it and Sandy Hook, there is a channel into Pleasant Bay, but seldom used.

Deadman's Island is an insignificant islet, about eight miles westward of Amherst Island. It has obtained its name, according to Mr. Adams,* from its resemblance, at a distance, to a body laid out for burial.

I shall now close this report, with a few more observations, generally upon the anchorages and soundings around these islands.

The only good anchorage ground to be met with among them, independently of the three harbours described, is in Pleasant Bay, from off Grand Entry Harbour to Amherst Harbour; and the usual and best entrance into this Bay from the westward, is round by the south-east, outside Entry Island. Any where within this Bay, a vessel may find good

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* This gentleman presented, the winter before last, a manuscript to the Literary and Historical Society of Quebec, containing some interesting information respecting the Magdalen Islands.

anchorage, in from three to eight fathoms water, but the vicinity of the harbour affords the best; the gradual shoaling of the water from a distance, besides breaking the force of the waves, as before said, afford vessels plenty of time to select their respective anchorages, and is particularly favorable to them when involved in the fogs, which, in the spring and autumn, are so prevalent, and so frequently occasion wrecks* on other portions of the coast by concealing the land from the navigator, while his soundings do not intimate its proximity. Some places are mentioned on the western side of the chain, as affording anchorage ground, but it must only be understood during certain winds, as, strictly speaking, this shore, from north to south, is deficient in any secure harbour or bay: vessels sometimes find a temporary security at L'etang des Caps, L'etang du Nord, and L'Opital.

Although the general accuracy of the outline of Des Barres' chart is acknowledged, there are important differences in the present state of the soundings and those laid down on it, which, whether arising from their shifting nature, or from original errors in the chart, should be noticed. Some of these I may venture here to point out; but all details must be left to the well known professional accuracy of Capt. Bayfield, R. N. who, being about to visit these islands in the course of his hydrographic duties, will soon leave us nothing to desire upon this head.

In coming round this point, and nearly opposite Old Harry, the *King Fisher* struck upon a reef, at a distance of

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* Four vessels were wrecked on some portion of this chain last year (1831). Colonel Bouchette states, that Captain Fougere, for ten successive years, brought off these islands about 200 shipwrecked persons (see his recent work); but this is evidently erroneous.

at least three miles from the shore. Capt. Douglas was taking soundings at the time, as fast as the man could draw and heave, and his last cry had been five fathoms. Upon mentioning this circumstance to Mr. Cormier, we were informed that a reef extended out from the point at least six miles.

From three to five miles S.S.E. of the eastern part of Cape Alright, a shoal exists, not introduced in any chart, on which there is only twelve feet water; it consists of white rocks, over which the sea breaks, in a storm, from the eastward.

About six miles south-west from L'etang du Nord, on the north-west coast, there is a rocky shoal, with only ten feet of water upon it.

The shoals, at the north-east point of the chain, are very dangerous, and extend much farther out than represented in Des Barres' chart, which, likewise, does not shew a sand bank, lying a short distance off Entry Island, to northward, called the Pearl Bank.

In the foregoing description of the topography of these islands, I have availed myself of Des Barres' chart, in those instances in which my own acquaintance with the *locale* is too vague to permit me to write confidently; this assistance, however, can obviously extend only to their mere outline and dimensions.

FOURTH REPORT.

POPULATION, HABITS, MANNERS, RELIGION.

READ BEFORE THE SOCIETY, 21ST JANUARY, 1832.

Whether these islands were, or were not, in part settled* by the French Government, before the conquest of Canada, is a disputed point on which has been, and still is founded, a legal objection on the side of some of the inhabitants to the claims of Admiral Sir Isaac Coffin, to whom they were conceded, by the British Government, in 1798, without the existence, as the complaining party asserts, of any right on the part of the Crown to make such a grant. Two or three judgments, however, having been given recently in the Law Courts of Quebec in favor of the Admiral, and a disposition to admit his claims is now as generally evinced as it was at the period of his visit to the island in 1806; such is the opinion, at least, of Mr. Doucet, the Admiral's agent. This gentleman asserts, upon the authority of some of the oldest residents, that the Magdalen Islands were first settled in 1767, by a Bostonian of the name of Graidly, who, introducing upon Amherst Island four Acadian families, from Prince Edward's Island, commenced, with their assistance, a fishery in seals, sea cows, and cod. Bouchette, however, says, in his recent quarto work, that as early as 1763, there were ten families on the islands, which had

* They were conceded to the Count St. Pierre, by the Duchess of Orleans, in 1720, but it does not appear at that period that any measures were taken to settle them.—(Hist. Gen. des Voyages, p. 676.)

only increased in 1791 to thirteen. It appears, on the authority of the former gentleman, that in 1793, twelve or fifteen families emigrated hither from the French settlement of Miquelon and St. Pierre; and that when Sir Isaac Coffin visited these islands in 1806, the population amounted to about 400; since which time it has continued to increase at the *average* rate of about twenty-six per annum, and amounts now (in 1831) to 1057, of which 580 are below the age of fifteen; 290 from fifteen to thirty; 162 from thirty to sixty; and 25 upwards from sixty to ninety-seven, the age of the oldest inhabitant.

This population is distributed into families or houses, as follows:—98 on Amherst Island, 48 on Grindstone Island, 38 on Alright Island, 5 on Entry Island, and 6 at the East Point on Coffin's Island, making 195 families; of these 20 are of British extraction, and 175 Acadian or French; about half the latter emigrated to these islands, from St. Pierre and Miquelon, in the years 1793 and 1802. In the last fourteen years the population has more than doubled itself, and appears to be now steadily on the rapid increase, wanting only the encouraging hand of Government, and of the proprietor, to make of the Magdalen Islands, notwithstanding their barren soils, a flourishing little colony.

The habits of these islanders are almost exclusively those of fishermen, to which they are accused of adding, occasionally, those of the smuggler and the wrecker; but, whoever believing these accusations, should imagine the former to resemble the habits of the bold, reckless, desperate, European smuggler; or the latter, those of the cowardly caitiff from the same quarter of the globe, who is accused of hanging out false lights to beguile vessels to their ruin,

would, in thought, injure a people as little addicted to desperate deeds of illegal enterprise, as to deeds of villainy.

Smuggling, on these islands, is scarcely a breach of the laws, for no law but the law of God is preached upon them; and were not that the case, their neglected and insulated state may well entitle the inhabitants to some indulgence in this respect, particularly, as without a contraband trade, they might sometimes want even the necessaries of life; as long as they are abandoned, therefore, to their own resources, it would be unjust to deprive them of the advantage which a *free* trade offers, it being well understood that precautions are taken to prevent these islands from being made the medium of introducing contraband articles into other parts of the Provinces.

Mr. Adams, in his interesting paper upon these islands, mentioned in my third report, contrasts, humourously, the activity of the Magdalen fishermen, when the tocsin of wreck is sounded on their shores, with the torpor which they exhibit in following their daily avocations. Did no other causes exist for this difference, than the excitement which novelty affords, in opposition to the tedium induced by monotonous repletion, they would, perhaps, be sufficient to account for it; but a more substantial reason will be found in the cargo of some well freighted outward bound merchantman, which, stranded on the coast of Anticosti, or, perchance, *nearer* home, presents to these fishermen the opportunity of making some very *interesting observations*, upon the kind of food and raiment with which their more civilized brethren of Quebec are wont to clothe their bodies, both inside and out. In following this occupation, when chance places it in their way, these islanders have never been accused of a want of humanity; and the wrecker

whose heart is alive to its dictates, is a valuable member of society, as his pursuits carry him often to the relief of the shipwrecked on desolate uninhabited coasts, where no friendly assistance could otherwise be expected. How different would have been the fate of the crew and passengers of the Granicus, had a vessel in the search after wrecks, fallen in with them; to have been accessory to their deliverance, would expiate a whole life of the *wrecker's* illegal appropriations.*

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* On our return from the Magdalen Islands last summer, we touched at several places on the island of Anticosti; among the rest, we visited the spot where the tragedy alluded to occurred, and where we met with a solitary individual of the name of Godin, the same who had charge, formerly, of the provision post here, which he is accused of having plundered and left, and by so doing, of having caused the horrible event; the substance of which, it is proposed to introduce in this place, with no idea, however, of communicating information which is new, but with the desire to keep alive, as far as it is in my power, attention to the necessity of rendering the recurrence of such a transaction impossible, by adopting suitable precautionary measures, some of which it is my intention to suggest presently.

On the 29th October, 1828, the bark Granicus cleared out from the Port of Quebec, on her homeward bound passage to the Cove of Cork, and being wrecked on the coast of Anticosti, not far from the East Point, the crew and passengers are supposed (for their conduct subsequently, up to the period of their dissolution, is only probable surmise, founded on strong presumptive evidence, there being no living witness to the transaction) to have met, in their search along the shore, with one of the direction boards, under the guidance of which they proceeded to the north-westward, as far as Fox Cove, where a provision depot formerly existed, and where the board alluded to above, taught them to expect one still. This board, according to Godin, was brought by one of the unfortunate wretches to this place, where it was afterwards found. Upon arriving at this post, they found it deserted, the provisions removed, and nothing but an empty log-house and store to receive them; into these they entered, and yielding to deplorable necessity, they appear to have submitted themselves, gradually but deeply, to all the horrors of cannabalism; for, what other reference could be

It has been already observed, that the inhabitants of these islands are accused of a want of activity in their fisheries, and there appears to be too much reason to believe this is true; for, had they half the industry which their annual American guests display, they never would abandon to them the whole of the herring trade.

Quarrelsome and deceitful dispositions have been laid to their charge; the former shewn in the use of abusive lan-

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drawn from finding the beams of their dwelling places shambled with human subjects, half carcase, half skeleton, from which the flesh had undoubtedly been removed, to a pot which was found resting upon the ashes of the extinct fire, the whole of its disgusting contents not *quite demolished*—from the discovery of a pile of "well picked bones" and "putrid flesh"—from the circumstance that money, watches, and gold rings, &c. &c. were found upon the premises, together with a pencilled note, signed B. Harrington, desiring that forty-eight sovereigns in his hammock (which were found) should be sent home to Mary Harrington, (probably his poor mother or wife,) Barrack Street, Cove, "as they are the property of her son." This man, the only unmutilated form among them, was found dead in his hammock, being the last to survive the cold, and the poisonous effects of this infernal feast.

Some fishermen from the Magdalen Islands, probably searching after wrecks, were the witnesses to these closing sorrows, and collecting them together, they were buried in a small piece of ground adjoining, now enclosed by a wooden fence. It was thought that the remains of three children, two women and eight men could be distinguished. The skeletons of two men were also found in the woods, to which they are supposed to have retreated, with the view of avoiding such a scene, and flattered by the hope of reaching a place of safety.

It is said, the boat of the *Granicus* was found on the shore of Fox Cove, when visited by the Magdalen fishermen, about the middle of May 1829, and hence it has been considered a subject for surprise, that when the crew and passengers found the post deserted, they did not return on their course and seek another, situated at the East Point, not far from the spot where they appear to have suffered shipwreck.

Whether blame does or does not attach itself to any person or persons in this unfortunate affair, is a question which there appears to be no evidence to determine, although much inquiry was instituted into it at the time. It is certain,

guage to one another, unaccompanied, however, by any more decided act of hostility; pugilism, being rare among them, as among the Canadians in general; the latter, in their transactions with the resident merchants and store-keepers.

Extravagance displayed in the use and consumption of articles above their means, is said to be another failing; one, however, which is common enough every where.

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that Godin himself was under imprisonment for debt at the period in Quebec, to which place he unluckily proceeded in the autumn; the post, as he says, having been withdrawn by authority, and the provisions having rotted. (Does salt pork or biscuit easily rot?) I understand, upon authority far better than Godin's, that the post had been withdrawn, and that he is correct in this respect; should he be correct also in his assertion respecting the direction board, a great oversight appears to have been committed in leaving on the ground such an *ignis fatuus* of destruction. However I must repeat, that there appears to be no evidence, which can be relied upon, of blame attaching to any one, and it need not be stated, that without such evidence, there would be injustice in attaching it. Not one of the public offices appears to contain a single document or deposition relating to the affair, which is extraordinary.

The Provision Posts on this island should, like the direction boards, be situated on the most conspicuous capes and headlands, so that it should not be necessary, as it is at present, to seek them at the bottom of some deep bay or indentation on the coast, in which obscure spot, one low unconspicuous dwelling may not only be found with difficulty, but is very liable to be overlooked, particularly by persons in the anxious position of shipwrecked mariners. Nor are the direction boards sufficiently numerous; instead of being placed at intervals of forty miles and upwards, one for every four leagues would not be too much. The materials also, of which they are constructed, are not of sufficient durability to resist the obliterating and decaying action of a boisterous coast. I should recommend that an iron rod, about 10 or 15 feet in length, be drilled into the limestone, which every where abounds, to the depth of two or three feet, having on its summit a well tarred direction board, or (better still) a plate of metal, with all the necessary information upon it, as to distance, &c. The expense cannot be made a reasonable ground of objection to this proposal, when the object is to

Though abusive among themselves, they are allowed to be unassuming and polite to strangers — of sober habits in general, they allow themselves a little licence in this respect after a successful fishery in seals—they are poor without pauperism, and independent without pride.

Robbery, murder, and other capital offences, appear to be unknown on these islands; there being no record of the occurrence of any such crimes upon them.

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prevent the recurrence of such a tragedy as the *Granicus*, besides permanently constructed direction boards will, in the end, prove most economical, requiring, as they would, neither repair nor superintendance.

The residents who have charge of the Provision Posts receive a salary of from £40 to £50 currency, but no provisions: it would be better to reduce this salary, and allow them a certain proportion, as an equivalent, out of the supply; but better still, make the allowance without any reduction,—it would be, probably, only granting graciously, as an indulgence, what their necessities may oblige them often to assume as a right, and, after all, they would not be overpaid for the sacrifice of passing their time in such a dreary place.

Fox Cove is situated towards the north-eastern extremity of Anticosti, on a sort of peninsula. At the bottom of the cove are erected the house and store, the theatres of the bloody deeds, with which the surrounding landscape is little in unison, being picturesque, calm, and sequestered. We found, however, a multitude of fine cranberries, whose mature blood red hue served to remind us of the event which had given such a sanguinary and savage notoriety to the spot. So intense was their colour, that it did not require much provocation, to an imagination already excited, to compare them to drops of the coagulated blood of the victims.

It has been rumoured abroad, that it was the intention of the Colonial Government to employ in the summer season a steamboat instead of the *King Fisher* for the purpose of carrying on its necessary communications with different parts of the Gulf, &c. There appears to me much to recommend in such an arrangement, particularly as regards the saving of time and expense. With respect to the former consideration, the advantage which a steamboat possesses over every other description of craft is too obvious to be insisted upon; and as to the latter, if a steamboat were paid by the trip, and not by the season, the ex-

Mr. Burnet, the Catholic Missionary, a gentleman highly respected on the islands, and to whom I am indebted for a memoir respecting them, which he politely drew up at my request, describes the manners of these people to be "doux et bien faisants, ils exercent volontiers l'hospitalité a l'egard des etrangers ; ils ont de la religion,* des mœurs purs, de la droiture et de la docilité a l'autorité† civile et religieuse."

I cannot presume myself to offer any opinion upon the manners and habits of these islanders, having seen so little of them, but what I did see, was of a very favorable description, and quite unexpected. I entered several of their houses, and found courtesy, contentment, cleanliness, and comfort, conspicuous. To the question, frequently put, "Avez vous de quoi vous plaindre," the same answer was always returned, "rien," accompanied by the characteristic shrugging up of the shoulders, which so perfectly indicates their origin. One individual, however, informed me, that he had the desire to abandon fishing in favor of farming, but that the uncertainty he was in, respecting his rights as a tenant to the land he occupied, prevented him, and his disappointment was considerable, when he found that the object of my visit was not connected with the survey of his and his neighbour's lands preparatory to giving them a deed

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penses under this head of service would be very materially diminished, particularly if she had permission to receive passengers or tourists on board, to which I can see no objection, but, on the contrary, the additional advantage of serving to make us better acquainted with the different settlements on the shores of the Gulf, and of facilitating commercial intercourses with them.

* Of this I had a proof, in the difficulty experienced to procure a guide into the interior one Sunday, of the probability of which, I was informed before hand.

† I know, however, of no civil authority on the islands.

of occupation. Sir Isaac Coffin has been written to by his agent on this subject, who expects an answer from the Admiral, authorising him to make such surveys as appear to be necessary: this the inhabitants have a right to expect, and its execution is quite as conducive to the interests of the landlord as the tenant.

The religion of nine-tenths of the inhabitants is Roman Catholic, and two churches on the islands are consecrated to its religious observances; one is situated at Amherst Harbour, the other at House Harbour. They are visited by the Missionary alternately. In the present neglected state of these islands, this gentleman's influence is highly important, not only in a religious point of view, but civil also, and he appears to be every way worthy of the confidence reposed in him. It is thought that the introduction of school-masters on these islands would not meet with his encouragement; but such an opinion, as far as efficient men are concerned, is probably erroneous, for the necessity of establishing one or more schools here is obvious; and pressing it must be done, however, either by the Colonial Government or Proprietor, as the inhabitants are much too poor to do it effectually themselves.

There is no medical man on the islands, and, I am informed, no encouragement for one, the inhabitants being remarkably exempt from disease and sickness. Bouchette describes them as being "in general, remarkably hale and healthy, with light complexions and sandy hair;" he also adds, "they are cheerful in disposition, and the females particularly modest and ingenuous." My own observations, as far as they extend, confirm this.

There are clergy reserves on these islands, but no military ones.

PIGMENTS OF CANADA.

Note by the Publishing Committee, respecting the Canadian Pigments sent to the Society for the Encouragement of Arts, &c. by the late W. Green, Esq.

The 47th vol. part 1, of the Transactions of the Society of Arts, contains, at page 39, a note by Mr. Cornelius Varley, upon the red lake sent to the Society from Canada, an account of which forms the most important part of the second article in the 1st vol. of our own Transactions. When specimens of the manufactured materials alluded to in that article, were submitted to the examination of the above mentioned artist, he reported so favourably upon the red lake, as to occasion the award by the Society of Arts of its Gold Isis Medal to Mr. Green. After a more minute examination of the red pigments in question, Mr. Varley conceived that he had not fully done it justice, in consequence of which another communication was made to the Society upon the subject, which was inserted in a subsequent number of its Transactions. The following are extracts from these communications.

Extract from a communication by Mr. C. Varley, inserted in Vol. XLVI. of the Transactions of the Society for the Encouragement of Arts, &c. page 141.

February 20, 1828.

"I have compared the colours sent by Mr. Green from Canada, with those in common use, and find them generally very good. The dark reddish brown, No. 1,* is a very useful colour, being nearly the same tint, but richer than madder brown. The lake, No. 2,† is a very valuable colour; it is a little flesh coloured or yellowish, when compared with Mr. Field's madder pink, and therefore not quite equal to it, but is as often wanted: it is much higher in tone than vermillion."

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* No. 1 is that portion of the colouring matter of the root of the plant Tsavooyan, which is soluble in water.

† No. 2, that portion of the same which is insoluble in water. (See Lit. and Hist. Society's Transactions, vol. I. p. 45.)

Extract from a further communication by Mr. Varley, inserted in Vol. XLVII. of the Transactions of the Society for the Encouragement of Arts, page 39.

March 12, 1830.

"When the Committee requested me to make trial of Mr. Green's lake from Canada, I examined it in reference to what had been a great desideratum till accomplished by Mr. Field in madder-lake, namely, to obtain the brightest permanent red quite free from any bias to yellow. Now this being effected in the brightest madder-lake, which has rather a bias to purple, renders it very valuable for mixing with blues, by which a brighter permanent purple is obtained than formerly. Therefore, in my note in Vol. XLVI. I said it was not quite equal to the best madder, but I should have added, for this particular purpose; for since writing that, I have found it to be as much superior to madder for an orange tint, as madder is for a purple, rendering the two lakes quite equal and equally to be desired, as neither of them is a substitute for the other. Being desirous of obtaining the brightest possible glow, for representing a sunset in water colours, which is generally done by mixing red and yellow, I took all the reds and yellows I possessed, to try which mixture destroyed the least light and could be laid the clearest; the result was, that the golden coloured chromer with Mr. Green's lake gave the brightest colour, and may be said quite clear; thus rendering it every way as much to be desired in the market as the madder was formerly."

ART. VI.—ON THE MEDICAL STATISTICS OF LOWER CANADA. BY WILLIAM KELLY, M. D. SURGEON, R. N.

READ 19TH APRIL, 1834.

THE Parochial Registers of Lower Canada are said to extend back to the first settlement of many parts of the Province. They have been always carefully attended to, and possess a degree of accuracy that would be difficult of attainment during the early stages of settlements in the adjoining states; but was rendered easy here by the social disposition of the people, which prevented them from settling in remote or isolated places; and their religion, which so strongly inculcates the necessity of having recourse to the Clergy, both on occasion of births and deaths. These registers therefore combine a degree of accuracy and duration, which is probably unequalled in any part of North America. They have not as far as I can learn, been hitherto investigated with any reference to the Medical Statistics of the Province, although affording the best and surest information on the subject. In the present paper I have only endeavoured to draw such inferences as may be obtained from the returns already printed; leaving to others the more arduous task of examining the manuscript

registers, connecting them with the printed ones, and extracting from both, all the various results which they are capable of affording.

The information which I have endeavoured to digest, has been derived chiefly from the Journals of the House of Assembly. The first returns appear in the Reports of the Committee on Crown Lands in 1824. It comprises the baptisms, marriages and burials in the District of Three Rivers, from 1791 to 1822; in the District of Quebec, from 1794 to 1821; and in the District of Montreal, from 1810 to 1822. There is an omission then in the Journals of the returns for three years, but since 1825 they have been regularly inserted.

In consequence of the comparatively short time for which the returns are made from the District of Montreal, and the occurrence of another gap of three years between 1817 and 1819, I have altogether omitted the consideration of that District prior to 1826.

It is to be regretted that no regular census has been taken in Lower Canada between 1784 and 1825, and that the published returns of the latter, and of the recent one in 1831, afford little that can be relied on, (as far as the objects of this paper are concerned) beyond the actual numbers of inhabitants. Even so simple a matter, as the total number of males and females separately, cannot be obtained from either, nor their relative numbers at any particular period of life. In the last census persons of both sexes under 14 years of age are given in the same column; and the ages at and under which the males are classed, beyond that period of life, are quite different from those used in the classification of the females. When the numbers of persons of different ages are summed up, they are found to exceed consid-

erably the total number.* The discrepancy seems partly owing to the number of females under 14 being sometimes placed under two heads; but in many instances neither a correction for this, or any other apparent source of error, could make the total, and details correspond. The census of 1825 is, in these respects, equally unsatisfactory. They also differ much from one another. In the census of 1825 the males above 60, are stated as 11,437; the females above 45, as 8,542; in the census of 1831, the males above 60 amounted to 13,243; the females above 45 to 27,613.†

Besides the regular census, however, returns of the amount of the population have occasionally been obtained from the Curés. Of these, within the period alluded to above, there was one in 1790, giving the number of persons in the different parishes up to the close of that year. It has not, I believe, been published, but the original papers are in the Civil Secretary's Office. Another, made in 1822, was published in the Report of the Committee on Crown Lands. The remarks accompanying the latter, contain much interesting information; but the omission of the returns for some Parishes, and of the protestants, detracts much for its value.

A comparison of the population of the Districts of Quebec and Three Rivers by the census of 1784, with the Curés'

* On correcting the return for Rimouski, which was estimated too high, and a mistake in the summing up of the total number in Bonaventure, I found the total number of persons in the Province, by the census of 1831, was 508,917. But adding together the numbers at each period of life, (those of Rimouski included,) and correcting an error of the press in the column of unmarried women, the whole amounted to 554,321.

† By the census of 1831 the proportion of insane was one in 549; of deaf and dumb, one in 1244.

returns of 1790, shews a rate of increase during the intervening period, much greater than in the subsequent one to 1825. Six years and a half, may seem perhaps too short a period to draw any conclusion from;* but the opinion, that the increase then was unusually rapid, is considerably strengthened by finding that the amount of the population, obtained by adding the excess of births over deaths to the calculated number for 1794, continues much above the increase, calculated from the census, until 1810; after which it falls below it.

The lower rate of increase in the latter period may be partly accounted for by an Emigration from the southern parts of the district of Quebec, mentioned in the letters of the Curés in 1822 †. Contrary to what occurs in every other part of the Province, the surplus of births over deaths in this portion of the district of Quebec, is greater than the actual increase of the population shewn by the census. This latter circumstance, however, must be owing in some degree to the natural efflux from the country to the town, which stands on the opposite shore.

As there was, howver, a considerable immigration into the district of Three Rivers during the time, and as the rate of increase in both districts conjointly, for the whole period, was such as to double the population in $25\frac{2}{5}$ years; it is probable that what was lost by one was nearly gained by the other, since the best information as yet

* The Curés returns were made at the close of 1790, and some of them in Jan. 1791. The census of 1784 has, I believe, been taken, as usual, in Summer.

† They state that many young persons finding it difficult to procure fresh lands in their own seigniories, went to settle in the seigniories of the district of Montreal, rather than remove to the adjoining townships. There has been also an emigration of voyageurs to the north-west, but they were chiefly from the district of Montreal.

obtained, leads to conclude that about twenty-five years are necessary for the doubling of a population by the natural increase under equally favorable circumstances.

The population of the districts of Quebec and Three Rivers in 1784, was 57,285. By the Curés' returns we find that it had increased to 70,909, at the close of 1790. At this rate it would have doubled in twenty-one years.

The baptisms recorded in the districts of Three Rivers, from 1791, and of Quebec, from 1794, to 1800 inclusive, were 31,493. The burials 14,330. The surplus added to the population* at these periods, makes it amount to 93,601, at the close of 1800. At this rate it would have doubled in twenty-five years.

The baptisms for the next ten years were 52,012, the burials 25,242. The surplus raises the population to 120,371, at the close of 1810; a rate of increase that would cause it to double in $27\frac{1}{2}$ years.

The baptisms from 1810, to 1820, were 64,825; the burials 32,085. The increase in the natural way raises the population at the close of 1820, to 153,111. At this rate it would only double in $28\frac{4}{5}$ years. The calculated population however, at this period, is 156,310; taking the census of 1825 as one point, and the population, as shewn by the natural increase at the close of 1800, for the other. At the rate of increase deduced from the calculation, it would have doubled in very little more than twenty-seven years.†

* That of Quebec calculated according to the rate of increase between 1784 and 1790.

† I have taken 1800 as one point of my calculation in preference to 1810.—Because, though the population by the natural increase at the latter period exceeds the calulated number, when the census of 1784 and 1825 are the bases of

In each of these periods we perceive that there has been an increase of the number of burials compared with the baptisms. In the first they were as 45½ to 100; in the second as 48½ to 100; and in the third as 49½ to 100. In the five years from 1826 to 1830, the ratio in the same districts was 51½ to 100.

This increase in the ratio of burials to baptisms, seems partly owing to immigration, and in some measure also to an increase of mortality in the City of Quebec, which bears a large proportion to the total mortality of the districts under consideration. In the five years from 1796 to 1800, the burials in Quebec, were to the baptisms as 67 to 100. From 1806 to 1810, as 76, 29 to 100; from 1816 to 1820, as 80, 24 to 100; and finally from 1826 to 1830, as 76, 28 to 100. Though in the last period the rate of mortality in Quebec had considerably increased, the births had increased in a still greater proportion.

The total number of male children baptized in both districts prior to 1822, is 80,756; of females 75,712. The proportion is 106, 65 to 100, or 16 to 15. In the district of Three Rivers (consisting almost wholly of country parishes,) the males were 23,001, the females 21,326. The proportion is 107, 86 to 100, or 14 to 13. In the City of Quebec, the baptisms from 1794 to 1821, were 9,976 males, and 9,520 females. The proportion 104, 8 to 100, or 22 to 21.

the calculation, it falls short of it, when the calculation is made between the population by the natural increase in 1800, and the census of 1825. Thus shewing in some degree the effect of immigration, which began to be perceptible about that time. The population of the two districts in 1825 was 175,425. I had some difficulty in ascertaining it, in consequence of the changes made in the division of the province by counties.

The total burials during the same period, were 40,486 males, and 35,370 females; 114, 46 to 100, or 8 to 7. In the district of Three Rivers, 10,411 males, and 9,591 females; 108, 55 to 100, or 13 to 12. In the town of Quebec, 8,623 males, and 6,641 females; 129, 84 to 100, or 13 to 10.*

The registers of baptisms in the whole Province since 1825, shew a proportion of 20 males to 19 females; the country parishes 17 males to 16 females; the towns 30 males to 29 females.†

The registers of burials in the Province since 1825, shew a proportion of 6 males to 5 females; in the towns more than 5 males to 4 females; in the country 7 to 6.—This however includes 1832, the season of cholera, which carried off a much larger proportion of males than females. If we exclude 1832, the proportions will be in the Province, 7 males to 6 females; in the towns 6 to 5, in the country 8 to 7.

The ratio of burials to baptisms from 1825 to 1831 inclusive, is 49, 64 to 100; in the towns 76, 5 to 100; in the country 44, 38 to 100. These proportions correspond very closely with those observed in the Districts of Quebec and Three Rivers alone, between 1810 and 1820.

The relative proportion of births and burials tends to make the number of males greater than that of females in the country; whilst in the town it tends to make the females

* The great comparative excess in the mortality of males in Quebec, was found chiefly in the Protestant congregations, including the principal part of the soldiers, sailors, and other strangers. The average burials was nearly two male Protestants to one female; whilst amongst the Catholics they were as 11 to 10.

† In the town of Montreal, the number of males born from 1826 to 1831, was 4,868; of females 4,927. In 1832 the females births were only 798, the males 934; but in 1833 the male births were 866, the female 951.

more numerous than the males. As something approaching this occurs in all great towns, it is probably one of the principal causes of the excess of female population observed in them.

An examination of the late census of Quebec and Montreal, which have been made with greater care than that of the country places, shews that the males in each town are less numerous than the females. But, as I have already remarked, there is no certain information on this head, as regards the country generally. In the Curés' returns in 1790, the males in the Country Parishes of Quebec and Three Rivers were 32,234; the females 31,023. In the census of 1784, the males of all ages are 54,064; the females 50,759. These last numbers do not include servants, the infirm, and slaves, who were not classed according to their sexes.

In calculating the annual rates of baptisms, marriages, and burials, I have chosen the periods at which they were calculated for the Report of the Population Committee of the House of Commons in 1831. For though we have not the advantage of a census at the end of each period, the reason which induced Mr. Rickman to select them for the report; still they are not only as good as any others, but may be of some use, as enabling us to see what relation our progress in these respects bears to that of one of the densest, and certainly the healthiest community in Europe.

The population of the Districts of Quebec and Three Rivers at the close of 1795, was 82,455, at the close of 1800, 93,601.* The mean 88,028. If we add to this 2000

* These of course can be only approximations. I may remark, however, that in making the calculations, I always adopted the mode that gave the greatest number; as I thought, by so doing, I was less likely to fall into any error, in consequence of the uncertainty of the amount of Emigration.

for soldiers and sailors, it will amount to 90,028. The baptisms in the intervening period were 21,201, giving an annual mean of 4,240, or one in 21 .23. The burials 9,538. Mean 1,908, or one in 47 .18. The marriages 3,532. Mean 706, or one in 127 .66.

The mean population of 1806 and 1810, allowing 3,000 for soldiers, sailors, &c. was 116,089. The annual mean of baptisms 5,583, one in 20 .79. The annual mean of burials 2,671, one in 43 .46. The annual mean of marriages 1,017, one in 114 .15

The mean population of 1816 and 1820, with the same allowance for soldiers, sailors, &c., was 149,560. The annual mean of baptisms 6,851, one in 21 .83. Annual mean of burials 3,286, one in 45 .5. Annual mean of marriages 1,180, one in 126 .74.

The mean population of the same districts between 1826 and 1830, with 3,500 for soldiers, sailors, &c. was 194,786. The annual mean of baptisms 9,440, one in 20 .63. Annual mean of burials 4,878, one in 39 .93. Annual mean of marriages 1,786, one in 109.

The mean population of the Province, exclusive of the District of Gaspé,* between 1826 and 1830, was 457,200; adding 5,000 for soldiers, sailors, &c. it becomes 462,200.†

* The registers from Gaspé are only for three years, and apparently defective

† The highest numbers allowed for sailors alone was only 1,000. As the number coming to the ports of Quebec and Montreal in one year did not exceed 12,000, if each on an average is supposed to remain one month, they will equal a resident population of 1,000 men. This allowance will not be thought too small on the present occasion, when we consider that these are persons generally in the prime of life, and accustomed to a healthy employment, and consequently not likely to add near so much to the mortality, and certainly not to the births, as an equal number of residents of both sexes, and all ages. The nnmber of soldiers and their families is easily ascertained. The remainder to the round number is an

The annual mean of baptisms were 21,583, one in 21 .41. The annual mean of burials 10,517, one in 43 .95. The annual mean of marriages 3,890, one in 118 .8.

The lowest rate of mortality was in the years 1799 and 1816; in the first it was equal to one in 52 .72; in the latter to one in 54 .3. The greatest mortality occurred in 1810 and 1820; in the first it amounted to one in 33 .14, in the other to one in 34 .5. In the District of Montreal in 1820 and 1821, the mean mortality was equal to one in 36 .91. Some portions of the District suffered most in one of these years, some in the other.

The greatest proportion of marriages occurred in 1812, when they equalled one in 97 of the population. This increase of marriages during war, so contrary to what has been observed elsewhere, is said to have been the consequence of immunities from militia service, allowed to married men by the laws of the colony.

The following summary shews all at one view. I have placed the results of the English returns below it, for the purpose of comparison:—

	Districts of Quebec and Three Rivers.				*The Province.*
	1796 to 1800,	1806 to 1810,	1816 to 1820,	1826 to 1830,	1826 to 1830,
Births,—one in	21¼,	one in 20¾,	one in 21¾,	one in 20½,	one in 22 2-5,
Burials, "	47 1-5,	" 43½,	" 45½,	" 40,	" 44,
Marriages "	127 1-3,	" 114 1-7,	" 126¾,	" 109,	" 118¾,

England,

	1796 to 1800,	1806 to 1810,	1816 to 1820,	1826 to 1830,
Births,—one in	36,	one in 34,	one in 35,	one in 37,
Burials, "	48,	" 51,	" 57,	" 54,
Marriages "	123,	" 122,	" 127,	" 129,

allowance for other temporary residents. When we consider that, of the Emigrants who are on their way to the upper province, many never land at Quebec; and that few of them remain more than a very short time there, the allowance made will probably be found fully equal to their influence on the registers in ordinary years.

The proportion of births in Canada to the population was nearly equal for all the periods, whilst the rate of mortality increased, contrary to what occurred in England at the same times. The average number of marriages fluctuated a good deal, and the mean ratio did not exceed that of England in so great a degree as might be supposed. The greater frequency of marriages in the Province would be better shewn if the ratio in both countries was drawn only by a comparison with the number of persons of a marriageable age. There is also a considerable difference in the productiveness of marriages in the new and old country, in England it is very little more than four children to each marriage, it is six in Canada.*

Doctor Price's rule for finding the expectation of life, or mean life, was to take a mean betweeen the annual rate of births and burials; but late investigations in England, led Mr. Malthus to consider that it is nearer the annual rate of mortality, and consequently longer than what is given by Dr. Price's rule. Mr. Malthus however states, that the mean life at any period is equal to the time which elapses until the mean mortality of a certain number of years, equals the mean births of a similar previous period. Guided by this rule, if we take the mean of births in the district of Three Rivers for the four years, from 1791 to 1794, it is found to be 860. The mean of burials of four

* The numbers obtained by comparing the marriages of 20 years (from 1796 to 1816) with the births of an equal period four years later was 6 1-5. I have struck off the fraction as a compensation for illegitimate births. This might be considered too small a reduction; but, as, when the numbers of children to each marriage is so great, the fruitfulness of marriages might be more correctly estimated by taking a greater interval than four years between them and the births, the average numbers assigned here to each marriage will not appear too high.

years, from 1819 to 1822, is 905. This would seem to shew a mean life of rather less than 28 years. The mean of births in the districts of Quebec and Three Rivers, during the five years, from 1801 to 1805, was 4,819; the mean of burials, from 1826 to 1830, was 4,863; indicating a mean life of 25 years. In the district of Quebec alone, the mean of births for three years, from 1794 to 1796, was 3,008, the mean of burials for 1819, 20, and 21, was 3,069; indicating a mean life under 25 years. If three years is considered too small for an average, and we take the mean births in the district for seven years, from 1803 to 1809, the number is 3,892; the mean of burials for seven years, from 1825 to 1831, was 3,928; seeming to indicate a mean life in the district of Quebec of less than 22 years.

As in all cases a portion of the mortality must have been furnished by immigrants, the mean life thus estimated, would be evidently too low, still making a large allowance for the increase of mortality from this cause, the mean life thus obtained would not be greater, perhaps not equal to the result of Dr. Price's rule, or 32½ years. Thus the baptisms in both districts, from 1794 to 1798, were 20,296; the burials thirty-two years later, from 1826 to 1830, were 24,317. As the population in 1821, by the highest calculation, was only 2600 more than the natural increase, and as the number of immigrants, who settled in the Province between 1826 and 1830, was not very considerable,* we

* In the census of 1831, this number of emigrants stated to have arrived in the Province since 1825, is 23,291, exclusive of Gaspé. But if the excess of births over burials between the censuses is added to the population of 1825, the difference between it and the total number by the census of 1831, is found to be only 14,407, which if both censuses were correct is all that could be allowed for immigration. Is it probable that the persons employed in taking the census included in the number of Immigrants not only the individuals who came into the country, but also their children born since their arrival? Can there be an emigration, to any extent, from the province?

can scarcely suppose that the surplus remaining in these districts, together with their descendants born since their arrival, would add one-fifth to the mortality of the native inhabitants.

If, on the other hand, we endeavour to ascertain what proportion of those baptized live to marry; and compare, for that purpose, the baptisms of a period of years, with the marriages of an equal period, 24 or 25 years later; the influence of immigration will tend to make the proportion appear larger than it really is. The total baptisms from 1801 to 1805 were 24,096; from 1802 to 1806, 25,015. The marriages from 1826 to 1830 were 8,930. If we take from the marriages the usual allowance of a sixth for second and third marriages, the number left for first marriages is 7,442. If we suppose the average age of marriages to be 24 years, nearly three-fifths of those born would seem to live to marry; and a still greater proportion if the mean age of marriage was 25 years.

A return of all the deaths in the Province for several years, classed, as is often done in other countries, according to the ages of the deceased, would be very useful in many respects, particularly in assisting us to estimate both the probability, and expectation of life.

It is a subject of general remark that cities and towns are more unhealthy than the surrounding country: and for the most part the rate of mortality in towns is considered to bear some relation to their size. Even on a small scale, the simple circumstance of many people living in the same building or apartment, though not crowded, seems to be inimical to health. Thus, the average mortality is observed to be greater in large hospitals than in small ones; and in the same hospital, greater in the large wards than in the

small.* Perhaps in no place or country is the truth of this observation more conspicuous than in Canada; the average mortality of the towns being nearly double that of the country. The following summary of the mean births, burials and marriages in the city of Quebec, may be compared with those already given for the districts, as the periods in both are the same:—

	1796 to 1800,	1806 to 1810,	1816 to 1820,	1826 to 1830,
Births,—one in	24½,	one in 22½.	one in 21¾,	one in 17¾.
Burials, "	36½,	" 29½,	" 27 1-5,	" 23 1-3.
Marriages, "	130,	" 105,	" 100½,	" 88 2-5.

To the calculated population in the first period 2000 is added for military and sailors, making the whole 11,850. To the second 3,000 is added, as the number of troops was increased, making in all 16,278. The total number in the third period with the same addition (for though the troops were fewer, the shipping, &c. was increased) was 20,898. In the fourth we have the mean of the censuses of 1825 and 1831, which, with 3,500 for soldiers, &c. amounts to 28,639.

The mean population of the city of Montreal by the census of 1825 and 1831 was 29,572, to which may be added 1,500 for soldiers, sailors, &c. The mean annual baptisms between 1826 and 1830 were 1,557, or one in 19 .95. The mean burials 1,125, one in 27 .62. Mean of marriages 347, one in 98 .18.

The mean population of the town of Three Rivers between 1825 and 1831 was 3,550. The mean annual baptisms from 1826 to 1830 were 186, one in 19. Mean burials 101, one in 35 .15. Mean marriages 34, one in 104 .4.

* Hawkins' Medical Statistics.

The annual mortality varied, in Quebec, from one in 18 in 1831, to one in 28 .2 in 1828: in Montreal, from one in 21 in 1831, to one in 28 .93 in 1828 : in Three Rivers, from one in 24 in 1826, to one in 46 .43 in 1829.

If to the calculated population of Quebec in 1832, we add as before 3,500 for soldiers, sailors, &c. it becomes 32,956. The deaths in that year were 2,611 males, and 1,430 females. The proportion one in 8 .15. The population of Montreal for the same year, with the addition of 1,500 for soldiers, &c. was 34,164. The deaths 2,096 males, and 1,817 females. The proportion one in 8 .73.* In Three Rivers, where cholera did not prevail, the deaths were 88 males, and 65 females; being one in 27 of the population.

In 1832 the mortality in the country parishes of the districts of Quebec and Three Rivers was equal to one in 42.8; in the district of Montreal to one in 30 .1. But if we examine the two previous years, we find that the country parishes of Montreal were healthy, whilst there was a considerable mortality in those of Quebec and Three Rivers. In the populous Island of Orleans, within three nautical miles of Quebec, the mortality in 1832 was only equal to one in 59 .94; being less than in any of the seven preceding years.

The following is the annual rate of burials in the country parishes of the several districts between 1826 and 1832:—

	1826,	1827,	1828,	1829,	1830,	1831,	1832,
Quebec,—one in	41 .47,	45 .91,	48 .43,	53 .77,	35 .96,	37 .86,	42 .0,
Three Rivers, one in	37 .63,	54 .0,	55 .33,	67 .0,	43 .27,	48 .60,	44 .8,
Montreal, one in	44 .0,	50 .0,	50 .6,	61 .0,	56 .61,	51 .42,	30 .1.

* In these calculations the passing emigrants are not estimated, from the difficulty of ascertaining what allowance could be made for them. It is stated by Mr. Buchanan that upwards of 2,000 emigrants died of cholera in 1832; and it is certain that the chief part of these deaths occurred in Quebec and Montreal.

We seldom find an increased mortality in all parts of the Province in any one year. In examining the registers in detail, I observed in some years an increased mortality in all the parishes along the river, save a few at one or other extreme; but those had an increased mortality in the previous or ensuing year, whilst the others were healthy.

The increase of mortality in any particular years seemed to be rather owing to the spread of disease from endemic, or other causes, than to any distress arising from scarcity of food. In 1828, and 1829, which were remarkable for a comparatively small number of burials in the northern division of the district of Quebec, some places in this part of the district, were reported to be in great distress from the failure of the crops; and similar reports were made at the close of 1816, which was remarkable for a low rate of mortality. The varied rate of mortality, in a series of years, in the different parts of the Province, is probably in part owing to accidental causes, the effects of which are more conspicuous as the community is small. If it depends on any endemic influence, it is rather singular that it should travel so slowly.

In estimating the healthiness of any place or period by the annual rate of mortality, the years of pestilence ought not to be excluded; for the severity of epidemics seems to bear some relation to the usual healthiness or unhealthiness of the places they visit. Now, if instead of estimating the healthiness of the towns of Lower Canada at present, by the mortality of the five years from 1826 to 1830, we take all the consecutive years of which the registers have been published, up to and including 1832; the ratio, already high, will be greatly increased. Before stating the results, however, it is proper to observe, that though the general

principle of including years of pestilence in our estimates, is correct, yet, when they occur rarely, they ought only to be taken in connexion with the returns of many ordinary years, certainly of more than seven or eight as in the present instance, and rather with the years that follow, than those which precede their occurrence.

The annual average mortality in the city of Quebec from 1825 to 1832 was one in 18.4. In Montreal from 1826 to 1832 one in 19.95. In Three Rivers one in 32.7.

The high rate of mortality is not altogether confined to the last few years: for in 1810 the mortality in the city of Quebec was one in 19; in 1820, one in 24. On the other hand, in 1798, it was one in 44; in 1816, one in 35.*

It has been already stated that the mortality in cities generally bears a ratio to their size. But as it is still more influenced by the general state of prosperity or misery; the towns, in which trade is brisk, and employment consequently easily procured, are found to be more healthy than less populous ones under opposite circumstances. The rate of mortality in London, and many other towns in England, is

* The returns for 1833 have just been sent in. They are particularly interesting in consequence of this being the year immediately succeeding the epidemic.—From the number of infirm persons cut off in the preceding year we expected that the mortality of this would be much below the usual rate. We find, however, that the deaths in Quebec were 741 males, and 530 females; in Montreal 703 males, and 608 females; in Three Rivers 47 males, and 45 females. If we suppose that the influx of immigrants and persons from the country had already compensated for the mortality of 1832, and that the population of the towns of Quebec and Montreal had consequently not been reduced; the ratio of the deaths to the population in both towns in 1833, was one in 26; in Three Rivers, supposing its increase unchecked, one in 46.76. The total return of deaths in the province (exclusive of Gaspé) is 5,870 males, and 4,913 females. Eight congregations, the mortality of which on previous years, was about 480 persons of both sexes, had not yet sent in their returns.—The whole mortality of the province in 1833, may be estimated as one in 47.

not half so high at present as in the middle of the last century; though their population is more than doubled. In Amsterdam, which has suffered from the decline of trade, the ratio of mortality has increased during the same period, whilst the population has diminished. From these considerations we are led to enquire how it happens, that the ratio of mortality has been increasing in Quebec during the last thirty years, notwithstanding its advances during the time in commercial prosperity.

In England, with the increase of wealth, there was an increased attention to the general police of the cities. The streets were cleansed, drained and paved; they were ventilated also, or at least pure air was more freely admitted by widening them, and an abundant supply of water, brought to every house, encouraged cleanliness within doors. Let us look to Quebec in some of these respects.—Within the walls the paving is tolerably good; but there has been as yet no regular system of cleansing the streets. The public sewers are in such a state, that some houses, in one of the principal streets, are scarcely habitable at times, in consequence of the stench proceeding from the sewers, and the mode in which several of them open in the Lower Town is most offensive. The suburbs, with few exceptions beyond the streets that form thoroughfares, or avenues to the country, have neither the advantage of paving or sewers. Prior to 1832 some of the streets in the suburbs were disgustingly filthy; and at certain seasons some are still barely passable by help of the logs that are laid in place of curb stones. After the melting of the snows in April and May, several streets in the flat suburb of St. Rochs are no better than sloughs; and very offensive sloughs too, from the accumulated filth that was hidden by the snow in

winter. Such places when acted on by the summer's sun must give out very noxious effluvia, capable of tainting the air to some distance from their source. The dread of cholera has caused some attention to be directed to the cleansing of the streets, and the same disgusting filth does not now meet the eye in passing through them; but little has been yet effected towards the equally material objects of paving and draining. Here are abundant causes of sickness; and when we add to them, the situation of the labouring poor, chiefly composed of immigrants, many of whom arrive here in a state of destitution; that their usual disposition to crowd together in their wretched habitations, is increased by the high rate of house rent, and the expense of fuel in winter; and that the filth usual in such circumstances is augmented in consequence of the want of a ready supply of water; we cannot be surprised at the frequency of disease and death.

Little attention has been hitherto paid by the inhabitants of Quebec to any cause of disease, save that arising from the state of the labouring poor. The town is considered very healthy, and nothing but a comparison of the mortality in it, with that of other places, can dispel the illusion.—But there is reason to hope that this unhealthy state will not be permanent. The situation of the Upper Town seems very favorable to health, and there is nothing unfavorable arising from the situation of the lower part of the town, which may not be removed or mitigated. When the main sewers are made of a sufficient depth, properly constructed, and carried without interruption to the rivers, the cleansing and draining will be easily effected. The streets of the suburbs will be gradually paved; though it is probable that the process will be slow, as the necessity does

not seem so urgent for the ordinary purposes of life, in consequence of the snow roads which serve so well during that half of the year, when roads are worst in other countries. What has been already done in Montreal shews that the severity of the winter need not prevent a supply of water from being sent in pipes through the town. If, however, this mode should seem too difficult or uncertain, some other means might surely be devised for affording a more ready supply of good water to the poor. It is the more called for, as the scarcity of water is perhaps the only one of the sources of disease peculiar to them, that can be met by municipal regulations. Those things can only be done at a considerable expense; but the object to be attained is worth any pecuniary sacrifice. Those, who may be chiefly called on to contribute, will do well to recollect, that when disease begins among the poor, it sooner or later spreads to the rich.

The causes of the high rate of mortality in Montreal are probably much the same as in Quebec. A cursory examination of the suburbs shews that much remains to be done there also, in the way of cleansing, paving and draining; and the benefits of the water works are, as yet, wholly confined to those who can afford to pay for them.

In 1833 returns were made to the House of Assembly of the baptisms, marriages, and burials in the Province during each month of the four preceding years. The substance of these is arranged here in a tabular form. I have separated the returns of the cities from those of the country parishes, and the ordinary years from the year of the epidemic.

Baptisms in the Province from 1829 *to* 1832.

	Jany.	Feby.	March	April.	May.	June.	July.	Augt.	Sept.	Oct.	Nov.	Decr.
Country parishes.	6430	6240	7400	6741	6979	6616	7157	6882	6988	6889	6318	6131
Towns	1105	1052	1121	992	1220	1317	1800	1341	1195	1174	1008	1098

Burials in the Province.

	Jany.	Feby.	March	April.	May.	June.	July.	Augt.	Sept.	Oct.	Nov.	Decr.
Country parishes, 1829-30. & 31.	1842	1994	2262	2181	2221	2199	2963	2789	2197	1894	1737	1825
1832.	596	677	823	966	991	1373	1808	3216	1512	920	637	563
Quebec, 1829-30, & 31.	243	232	240	236	274	422	544	577	406	339	344	337
1832.	85	78	74	66	111	1366	650	714	407	202	133	94
Montreal 1829-30, & 31.	267	243	228	206	257	321	546	565	346	330	285	320
1832.	114	106	150	167	172	1130	663	740	295	149	1 5	112

In the country the greatest number of births occurred in March, of deaths in July and August; the least number both of births and deaths in November, December, January, and February. In the towns the greatest number both of births and deaths occurred in June, July, and August, the least in the winter months. In 1832 we find that the increased mortality commenced in March, though cholera did not appear until June. The increased mortality in the spring was chiefly in the city and district of Montreal, where in March it amounted to nearly one-half more than the mean of the three preceding years; it increased still more in April, and in May it was nearly double. In December the rate of mortality was below the average of the same month in the preceding years.

A physician is here led to inquire, what are the diseases that cause such an increase of mortality both in town and country during the summer months; for if they were known their causes might be examined into, and perhaps measures suggested for lessening their frequency and fatality.

This information can only be obtained, as respects the country parishes, by reports from the local medical practioners. In the towns we are led to expect the most useful information in hospital records. In having recourse to these in Quebec, however, my expectations were very much diappointed. My attention was first directed to the Hotel Dieu and General Hospital, which, on account of their long standing, seemed likely to afford the necessary information, free from the uncertainty that is attached to the results obtained from establishments of recent origin, in consequence of the occasional prevalence of particular diseases. But, as persons labouring under diseases supposed to be infectious, are not admitted into either of these hospitals, their records, however, valuable in other respects, could not be very useful on the present occasion.

My next recourse was to the Emigrant Hospital. The patients in this establishment, not being inured to the climate, are likely to suffer more than others from any cause of disease dependant on the seasons. The state of poverty and destitution, in which many of them arrive, render them peculiarly liable to be effected by any cause of disease in existence at the time ; hence a knowledge of the diseases most fatal to them, could not fail to throw great light on the nature of the endemics of the Province. The records of this hospital, however, have been kept, until very lately, in such a slovenly irregular manner, that little information can be obtained from them. The principal part of the mortality amongst the emigrants in summer, as far as it can be collected from the hospital books, appears to be owing to fevers and dysentery.

By the kindness of Doctor Skey, I have been afforded every facility in examining the medical records of the

army in Canada. As the information they contain is most accurate, and as the health of the troops in each year, bears a relation to the general health of the Province; these records are very valuable in assisting us to form an opinion respecting the diseases of the different seasons.— The following table shews the hospital admissions and deaths in the Army in Lower Canada, during each quarter of the year, from 1820 to 1827. I have distinguished the diseases that usually depend on climate or season, or that have been remarkable for frequency, or fatality. The remainder are included under one general head. The first quarter extends from the 21st of December to the 20th of March, the second from the 21st of March to the 20th of June, the third from the 21st of June to the 20th of September, the fourth from the 20th of September to the 20th of December.

1820 to 1827.	Fevers.		Pneumonia.		Rhumatism.		Phthisis and Hemuptysis.		Catarrh, acute, and chronic.		Dysentery and Diarrhœa.		Other Diseases.		Total.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1st quarter.	332	10	246	5	101	0	41	20	349	5	109	1	1808	15	2986	56
2d do.	747	3	328	14	163	0	39	27	365	3	176	0	2034	11	3852	58
3d do.	1051	9	189	9	158	0	21	17	245	1	659	1	3057	23	5380	60
4th do.	539	13	216	2	128	0	29	10	274	1	251	0	2214	17	3651	43
Total.	2669	35	979	30	550	0	130	74	1233	10	1195	2	9113	66	15869	217

The greatest number of deaths from diseases not specified were 14 from Apoplexy, arising chiefly from drinking inordinately of spirituous liquors; 8 from small pox; 6 from enteritis; 6 from dropsies; 6 from wounds and accidents, and 4 from atrophia. Except the deaths from Enteritis,

five of which occurred in the first quarter, none of them appear to belong to any particular season. The admissions both with Apoplexy and Enteritis very little exceeded the deaths.

The number admitted with fevers in the second and third quarter, was more than double that of the first and fourth; whilst the mortality scarcely exceeded one half. The mortality from Pneumonia on the contrary was greater, and Rheumatism was more prevalent in the spring and summer, than in the winter. These results are, I believe, contrary to popular opinion, and perhaps to popular experience.

The following shews the ratio of mortality in the army in Lower Canada from 1820 to 1831 :—

Year.	Mortality per cent.	Year.	Mortality per cent.
1820	1 .109	1826	1 .842
1821	1 .120	1827	2 .132
1822	1 .124	1828	0 .574
1823	1 .397	1829	0 .626
1824	1 .574	1830	1 .303
1825	1 .674	1831	1 .681

The mean annual mortality was 1,333 per cent. The mean during the same period in Upper Canada was 1,253 per cent.*— The mortality was considerable in the upper province in 1828 and 1829, when the troops in the lower province were healthy. It was pretty equal in both in 1830; but in 1831 it was light in the upper province, (only one per cent) whilst it was above the average in the lower. This circumstance bears a resemblance to what has been already remarked respecting the progress of disease in the different districts of Lower Canada.

* This alone cannot be considered a proof of superior healthiness in the upper province, as some (though probably very few) of the persons who died in the military hospitals of Quebec were invalids, on their way home from Upper Canada.

The annexed table shews the mortality by different diseases in the military hospitals of both Canadas from 1810 to 1822. Though it does not assist our enquiry into the diseases of different seasons; yet it is valuable in other respects, particularly in enabling us to estimate the prevalence or mortality of particular diseases at different periods. It is copied from one prepared for the Army Medical Department, the only alteration I have made is the condensing under one head several diseases of comparatively infrequent occurrence, and adding a column of per centage ·—

General Abstract of deaths in Hospitals of the Army serving in Canada, from the 21st of December, 1809, *to 20th December,* 1822.

Years.	Average strength of the Army during each year.	Number of sick admitted during each year.	Total number of sick treated during each year.	Diseases.															
				Fevers.	Pneumonia.	Enteritis.	Hepatitis.	Variola.	Rubcola.	Phthisis and Hemoplysis.	Catarrh.	Dysentery.	Diarrhœa.	Apoplexy.	Dropsies.	Wounds and Accidents.	Other Diseases.	Total Mortality.	Mortality per cent.
1810	4183	4835	5142	32	33	..	..	..	..	..	..	10	1	..	..	13	..	89	2.128
1811	4426	5616	6074	60	16	..	..	..	..	..	4	2	..	..	..	10	7	99	2.237
1812	6140	8424	8852	48	55	..	..	..	1	22	22	14	20	..	5	13	10	210	3.257
1813	13698	17748	18831	201	96	9	1	11	3	31	..	51	16	3	11	64	9	506	3.694
1814	23393	29230	30489	241	109	5	..	39	2	59	5	159	30	1	16	180	23	869	3.714
1815	16346	6816	15325	122	59	2	1	1	2	55	..	47	11	3	6	9	34	352	2.153
1816	6130	6177	6807	12	16	2	1	..	..	15	..	6	..	3	4	2	8	69	1.093
1817	4671	4176	4576	14	11	..	..	..	..	16	4	16	1	..	3	5	13	83	1.777
1818	4170	3493	3762	7	6	4	..	..	..	16	2	5	..	4	4	5	6	59	1.414
1819	3790	3063	3370	6	5	..	3	..	..	8	..	..	..	..	1	1	4	33	0.898
1820	3341	3281	4562	2	10	..	..	1	..	4	1	..	..	..	1	5	5	29	0.868
1821	3316	3503	3796	9	9	1	1	..	..	9	1	..	1	1	..	3	1	36	0.086
1822	3276	3153	3297	4	4	1	..	..	..	8	3	..	..	2	1	..	4	27	0.824
	99485	99485	114883	758	429	24	7	52	8	243	49	315	80	18	52	310	124	2461	2.540

If we compare this table with the table in page 207, we observe that the deaths from consumption, between 1810 and 1822, bore a much smaller proportion to the whole mortality, than from 1820 to 1827.* In the first period the amount is under 10 per cent. in the last 34. Excluding from the former the returns of 1812 to 1815, when the war and its consequences added so much to the whole mortality, the proportion of deaths from Phthisis is still only 12.6 per cent.

As it seems very difficult to account for such a disparity in the proportion of deaths from Phthisis in men under the same circumstances; we might suspect that it arose from diseases of the chest not being so accurately distinguished formerly, as they have been of late. But if any error in this respect existed, it would, most probably, be rather in applying the name of consumption to diseases which do not strictly come under that head, than in withholding it, and so far would tend to lessen, rather than increase the disparity.

If, in order to avoid any error which might arise from this cause, the deaths from all diseases of the chest in both periods are compared, they are found in the first to be 29.2 per cent, of the whole, but deducting the period of war, as before, 43.5 per cent. In the latter period they are 52.53 per cent. Thus, whatever the cause may be, the deaths from pulmonary disease appear to have increased.† The

* The deaths from Phthisis in the army in both Canadas from 1820 to 1831, was 33 per cent of the whole mortality.

† I have dwelt more on this subject from having formerly seen it stated (I think in the Edinburgh Medical Journal) by a Medical Officer who had served in Canada, that the climate, contrary to what might be supposed, was favorable to persons of consumptive habit, and that soldiers who arrived in the incipient state of the disease, were frequently restored to health.

deaths from Dysentery and Diarrhœa, on the contrary, bear a much less proportion to the whole in the latter period than the former, even if the years of war are excluded. This is probably owing, at least in part, to an improved mode of medical treatment.

From the scanty information I have as yet been able to obtain, no conclusion can be drawn respecting the diseases that cause the increase of mortality in summer. Fevers and bowel complaints would seem to be the most prevalent diseases in the towns in this season: for under these heads are the principal part of the admissions and deaths in the only hospital that receives cases of every description; and the same diseases are also very prevalent amongst the military, though from being early attended to, and from the better condition of the men, they are seldom fatal. It is asserted that a principal part of the deaths in summer occurs in young children; but we have no returns by which it might be ascertained.

Whatever the diseases may be, there is reason for suspecting that many of them are produced by exhalations from the soil disengaged by the intense heat of the season. It is now generally admitted that Dysentery often proceeds from this source, and continued fevers seem to be frequently the consequence of Miasmata in countries, and seasons in which intermittents do not prevail; though the latter as being the most obvious effect of Malaria, are usually the only fevers attributed to it. It may be mentioned, as bearing on the subject, that in places where Malaria prevails, it has been ascertained that a more than ordinary proportion of the mortality occurs in the early periods of life.

If these views are correct, there is reason to hope for a gradual improvement in the health, and a prolongation of

the average life of the inhabitants both of town and country; in the one by an enlightened police, and in the other as a consequence of the drainage that must accompany an improved and extended system of cultivation.

I have endeavored to point out what seem to be the most obvious causes of disease, but probably not the only, nor perhaps the chief ones. The medical practitioners, who in the discharge of their duties, frequently visit the abodes of the poor, may see others that escape the eye of one who has, comparatively, few opportunities of observing them. Be this as it may, it is certain that the mortality in the towns of Lower Canada is very great, and calls imperatively for the utmost exertions of all classes to remove or lessen any source of disease that can be clearly pointed out.

ART. VII.—NOTES ON SOME OF THE CANADIAN SONG BIRDS. BY MRS. SHEPPARD, OF WOODFIELD.

READ 16th FEBRUARY, 1833.

An opinion has prevailed principally through the assertions of Buffon, that the American birds have little or no song, but what is harsh and unmusical. In order to prove this opinion incorrect, Proffessor Rennie has given in the Magazine of Natural History, a sketch of twenty-four American song birds; the details he says are chiefly taken from Wilson. His sketch is quite sufficient to prove that the American woods are by no means deficient in melody; yet in compliance with the request of a friend who must not be denied, a few additional examples of singing birds not mentioned, as such, by Wilson, will now be offered.

Although not favoured with the inchanting song of the mocking bird, which inhabits more southern parts of America, we are visited by most of the professor's twenty-four birds, and by some other songsters whose sweet notes are not well known south of Canada.

The fox coloured sparrow (Fringilla rufa) visits this place, on its way to the northern regions, early in spring, and for some time sends forth a truly melodious song. It returns south towards autumn, and I believe does not sing during winter, for Wilson terms it a silent bird; once only he heard a single one a little before the time of their departure, warble out a few sweet low notes. Here it has a loud clear and melodious song consisting of about

six syllables often repeated, with something the tone of a German flute. The notes are bold and full, yet rather plaintive, reminding one of a pleasing but melancholy tale. With this musical song we are seldom treated, as the bird remains a very short time in this part of Canada. It has however been heard so late as the middle of July, but that is a rare occurrence.

The white throated sparrow (Fringilla albicollis) sings sweetly here during summer. Numerous flocks arrive early in May, and remain until autumn. They are quarrelsome and very revengeful, yet while listening to those birds, one might suppose that they spent all their time in "ways of pleasantness and paths of peace." So calm and composing are their notes that a feeling of tranquility is imparted to the listener. The song although rather monotonous, is so pleasing that strangers on first hearing it, seldom fail to exclaim "how beautiful!" It consists of a loud clear whistle, each note very distinct and sweet; a few individuals give a kind of shake, which by some may be thought finer than the more simple strain. It is probable that they do not sing far south of this place, for Wilson states that they also only sing a few low or weak notes a short time before their departure. He likewise states that the colours of the female are less brilliant than those of the male, the throat not being of so pure a white; that, however, only denotes the young birds, and the full grown in their winter dress. Several pair have been seen so exactly alike that they could only be distinguished by the peculiar noise which the female often utters for some time previous to building. When angry they both have a sharp note with which they threaten those who approach too near their nest.

The Purple Finch, (Fringilla purpurea,) another bird with whose song Wilson was unacquainted, may be heard here, both in summer and winter. During the months of December and January last we were almost daily visited by hundreds of those pretty creatures, some flitting close over the house, others hopping on the windows as if striving to gain admittance. The coldest weather does not prevent those pleasing visitors from paying us their morning call. After mid-day they disappear, seeking shelter in the thick pine forests, and we see them no more until the next clear cold morning. They have a most melodious chant, composed of a variety of soft notes: even when quarrelling their threat is not expressed by harsh or sharp sounds.—Wilson has compared the song of some birds to the tinkling of a small bell; the Purple Finch's note of displeasure might be mistaken for such. In their excursions they are often accompanied by the Pine Grosbeak, (Pyrrhula enucleator) and the lesser Red Pole, (Fringilla linarea.) The lively colour of all those birds, together with their sweet whistle and sprightly motions, add much to the exhilarating feelings caused by a bright winters morning. At such times a pleasing astonishment is felt that happiness so pure may be produced by merely observing a small portion of the beauties of creation, and that too in the depth of winter, when all is supposed to be dreary and uninteresting; those little creatures thus help to fill the mind with gratitude towards that Being "Who in his sovereign wisdom made them all." It is asserted that the Pine Grosbeak sings at night; it may rarely do so, but it certainly sings sweetly here at this season in the day time.

The two Cross Bills, (Loxia curvirostra and Loxia leucoptera) may be mentioned among our winter song birds.

Their notes are not so melodious as some of the foregoing, but they have a lively kind of chattering song which many find pleasing. These birds are so tame that a very few days after being captured they become quite familiar, and will eat out of the hand.

The Hermit Thrush, (Turdus minor. Gm.) although perhaps inferior to the Wood Thrush, is a cheerful and melodious songster, not uncommon here. He will sing through part of June, July and August, with much sweetness and some variety. Part of the song resembles the higher notes of a distant violin, at times only just audible, then a few notes may be distinctly heard more full and mellow, as if proceeding from some sweet wind instrument; his strains

"Now louder and yet louder rise,"

and are continued for twenty or thirty minutes.—Sometimes, though rarely, the delighted listener is disappointed by the provoking little creature suddenly changing his dulcet notes for sounds very like the mewing of a kitten. Few birds excel this in elegance of motion, when tamed they become quite fascinating by their graceful movements; they will at times alight gently in a theatrical posture, and examine what may be going on with a scrutinizing and most intelligent eye.

The Black Cap (Parus atracapillus) is a pretty active little bird, that may be seen here at all seasons, hopping about in search of food, he is an inferior songster, but in winter his twittering lay and plaintive mellow whistle is rather pleasing.

Some birds that arrive here in winter may occasionally be seen in summer. The Purple Finch, Siskin and Lesser Red Pole are often seen at that season, but the Purple Finch is not then met with in those large flocks with which we are visited in winter.

ART. VIII.—ON AN INSCRIPTION FOUND IN THE HEART OF A GROWING TREE.—BY WILLIAM SHEPPARD, Esq. OF WOODFIELD.

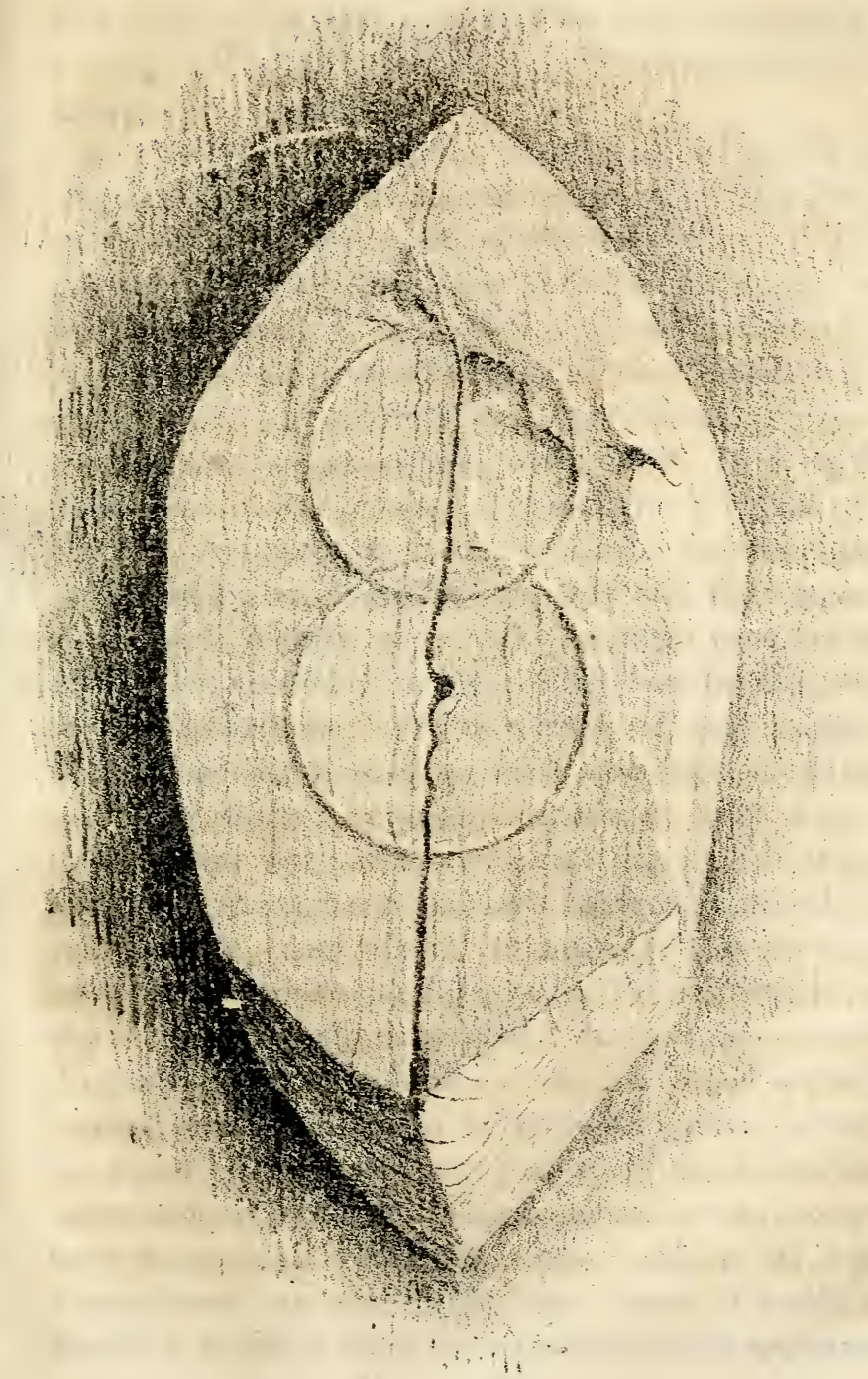
READ 2D FEBRUARY, 1833.

The discovery of a surveyor's mark in the interior of a tree, may possibly tend to illustrate the outward increase of wood, which is admitted to take place annually in those families of the Exogenous class of plants consisting of trees and shrubs. At all events, it may be a curiosity.

The little block of wood exhibited, of which the annexed sketch is a representation, was lately chopped out of a standing Hemlock Spruce, by a surveying party, in the township of Halifax.

On the inner surface, or that towards the heart of the tree, is perceived, plainly raised in relief the figure 8, supposed, with great probability, to have been made by the hand of man; and to have occurred in the following manner.—Some thirty years ago, this and the adjoining townships were surveyed and laid out into ranges and lots; the surveyor employed on this service, besides setting stakes in the usual manner, was in the habit, it is supposed, of scoring corresponding numbers on neighbouring trees, as an index to the post or stake. In the present instance a Hemlock tree was selected for the purpose; first being blazed with an axe, and then scored by a marking iron; two circles, one over the other forming the figure 8 in this case.

Surveyor's Inscription found in the heart of a living tree
V. McSheppard's Paper p. 226.



On close inspection of the cast or impression, the blaze appears not to have been made quite smooth and even, one part being more depressed than the rest, which part the scoring iron failed to touch; that portion therefore of the impression is imperfect.

It is a subject of regret that the chip taken from the tree, was not large enough to trace the yearly increment of wood, from the time of being marked; some few circles first formed at the lateral edges of the wound appear to be wanting. It would have afforded a good opportunity of proving the correctness or falsity of the common opinion, of the concentric circles visible in transverse sections of trees being yearly deposits of wood under the bark, by a comparison of the number of these with the date of the survey. Imperfect as is our specimen for this kind of investigation, an approximation may yet be attained.—Nine yearly deposits of wood are counted from the outer edge of the specimen, to a very visible centre line, where the new wood joined over the wound: so that, supposing the block to have covered the whole space blazed, that space was quite covered by annual deposits of wood from the lateral edges of the wound in nine years. The deposits near the blaze appear to be much larger than those formed subsequently; from which circumstance may be implied an increased impulse, or energy of action put forth to cover the wound as speedily as possible. It also appears on close inspection, that the junction of the new wood across the wound, took place earlier in the lower part of it than in the upper; several successive joinings of wood from below upwards being apparent. This circumstance may, however, have arisen from accidental causes; such as the wound having been narrower below than above; it would not, therefore, be safe to build any hypothesis on this appearance.

After the junction of the two lips of the wound, twenty more circles are counted to the bark; some of them very minute, sixteen existing in the space of the outer half inch. We have now got twenty-nine years for the time elapsed since the mark was made on the tree, but which very probably is less than the real time, from the circumstance already stated.

The new wood will be found to have entered all the cavities made in the tree, forming a complete cast over the blaze and number; yet as may be supposed, no perfect union of the wood has taken place; the chip having parted freely from the wound without bringing away a single particle of the old wood beneath.

Although the exhibition of this little piece of wood has failed to throw any light on vegetable physiology, it may be interesting to some persons to know that such marks exist in the surveyed townships, concealed in the hearts of trees; and may be sought for with some probability of success. The experienced woodsman who accompanied this surveying party, perceiving, near where the line was supposed to exist, a tree with cicatrices in the bark, on opposite sides of the stem, as if made by an axe for some purpose at a former period; thought that information might be obtained, as in a previous case, by an inspection of the interior of the tree. He applied his axe above the cicatrice with force sufficient to bring off the chip of wood in question; much to the satisfaction of the parties present, as it displayed to their view the mark of the eighth range of which they were in quest.

ART. IX.—ANALYSIS OF A MINERAL WATER SENT FROM GASPÉ.

The water which is the subject of the following analysis, was procured from the North side of the S. W. branch of the Gaspé River, and four miles upwards from its mouth. The springs which afford it are three or four in number, and arise from the bottom of a natural well or basin about three feet in diameter, and situated on the declivity of a hill, about one mile from the bank of the river. At intervals bubbles arise from these springs, and floating on the surface a few seconds explode; a white sediment is observed on the leaves and roots which are under the water, and the same is noticed in the moss and grass through which the water flows. The loose rocks on the hill and on the way to the springs are all composed of a yellow sand stone, sometimes inclining to gray.

Mr. McConnell, of Gaspé, transmitted to the Society some water from a spring at Gaspé, and accompanied it with the following notices :—He states that the spring had been lately discovered ; that it is situated about half a mile from the shore, near to Gaspé Basin, and that it gushes from a bank of sand stone. The sample of water was referred to us for Analysis, and we beg leave to submit the following report upon it :—

The water submitted to us was contained in two wine bottles, well packed, but unfortunately not quite free from the lees of wine.

The water itself was perfectly bright and clear, and did not deposit any sediment on exposure to the atmosphere.

Some gas was discharged in uncorking the bottles; principally, if not wholly sulphuretted hydrogen : of which it had a strong odour. This was not removed by boiling nor by exposure to the atmosphere for several hours.

When the water was heated, and prior to its boiling, more gas was disengaged, but its amount could not be ascertained from the want of a mercurial trough.

Its specific gravity at 53° of temperature was 1.000; snow water, which was the purest water we could obtain, being 1 .000

The water was submitted to the following experiments:—

1. The addition of lime water produced no cloudiness.

2. When Tincture of Galls was added to a portion of the water, no immediate change took place, but after the lapse of forty-eight hours the mixture assumed a blackish tint.

3. Prussiate of Potash was added to another portion without any result, immediately, or twenty-four hours afterwards: until a few drops of Muriatic acid was added, when after standing seventy-two hours, the mixture became of a light blue color.

4. A solution of oxalate of Ammonia produced a copious precipitate.

5. As also did the addition of Nitrate of Silver.

6. But no cloudiness resulted when Nitrate of Baryta was added, either before or after boiling the water: or when it had been exposed for some time to the atmosphere.

7. Thirty-two and half cubic inches, (an imperial pint,) were slowly evaporated in order to collect the bodies held in solution,—a dark coloured sabulous incrustation (A) formed, which when dried in a watch glass over a spirit lamp, became almost black, giving out an empyreumatic odour. It then weighed 7 grs.

8. about 6 gr. of the dried matter (A) were boiled in 8 or 10 times this weight of distilled water; the solution (B) became discoloured. Some insoluble matter (C) remained on the filtre, which when dried weighed about 2 grs.

9. The powder (C) was treated with diluted muriatic acid; when it was almost wholly disssolved with effervescence, leaving, however, a little brown residuum (D.) in neutralizing the excess of acid with aqua Ammonia, a copious precipitate was formed, when oxalate of Ammonia was added.

10. The brown residuum (D) was then exposed to a white heat in a platinum spoon, by which its colour was destroyed, still leaving, however, some particles of solid matter.

11. To half the solution (B) nitrate of silver was added, which occasioned a copious precipitate, weighing 3 grs. when dried ; insoluble in nitric acid.

12. Nitrate of Baryta also now produced the slightest possible diminution of transparency in the solution.

13. While the addition of oxalate of Ammonia occasioned a very copious precipitation.

14. The remaining part of the solution (B), to wit $\frac{1}{4}$ of the whole, was slowly evaporated upon a watch glass, when cubical crystals were left, having a strong tendency to deliquescence. The salt on being washed with alcohol lost somewhat of this tendency. When dry it weighed about 2 grs. before digestion with alcohol; but on redrying after digestion, it was diminished nearly $\frac{1}{2}$ a gr.

15. When Carbonate of Ammonia and Phosphate of Soda were added to the water of the spring, a slight cloudiness resulted.

From the facts now stated, it appears that the water under examination contains the following ingredients,—unfortunately the quantity was too small to justify an attempt even to ascertain their precise proportions :—

From its sensible qualities, as well as from No. 1, it results that the principal gasious body was sulphuretted hydrogen; that carbonic acid at least did not form any notable part of it.

Nos. 2, 5 and 9, imply the presence of iron, in the state either of a carbonate or of a peroxide.

From Nos. 4 and 13 we infer the presence of lime, and from Nos. 2 and 14 that it exists in the form of a carbonate and a muriate.

No. 5 proves the presence of muriatic salts; and from No. 14 that muriate of soda was a principle one.

No. 6 implies the absence of any salts which contain a basis of sulphuric acid.

From No. 7 it appears that it is almost impossible to avoid the introduction of extraneous matter, without a well established laboratory, however carefully the analysis be conducted. Thus the colour and the smell of the residiuum from the presence of some animal and carbonaceous matter. The presence of the latter was confirmed by No. 10.

The solid matter left after the combustion of the charcoal in No. 10, was probably siliceous, since it was not soluble in either of the mineral acids. Its quantity was too small to be tested in any other way.

From Nos. 2, 8, 11 and 14, it is ascertained that muriate of soda formed by far the largest proportion of the saline ingredients, yet we infer from No. 13, and from No. 14 in particular, that muriate of lime exists in a small proportion.

From No. 15 we were led to infer the presence of a minute quantity of magnesia in the water.

The above is the best analysis we can furnish of the water submitted to us, under the unfavourable circumstances of deficient means, both from the smallness of the quantity sent, and from the want of a laboratory duly fitted up.

This water much resembles that of Moffatt in Scotland, and probably possesses the same medicinal virtues. The active ingredients, however, are in such small proportions that we do not conceive it is likely to become of any considerable value as a medical agent.

JOS. SKEY, M. D.
WILLIAM KELLY, M. D.

Quebec, December 21, 1833.

ART. X.

ANCIENT DOCUMENT RELATING TO ACADIA.

NOTICES OF THE FAMILIES OF LA TOUR AND D'AULNAY, THEREIN MENTIONED, SO FAR AS THEIR HISTORY IS CONNECTED WITH IT.

COMMUNICATED TO THE SOCIETY BY MR. COCHRAN, ON PRESENTING THE PAPER, 7TH DECEMBER, 1831.

It being a part of the objects of the Literary and Historical Society, to procure and publish documents relating to the Civil History of British North America,—the accompanying paper being a contract of marriage in 1653, by which the families of La Tour and D'Aulnay, the then contending claimants and possessors of the greater part of Acadia, became united, appears to be worthy of being preserved on record, as authenticating a fact in the early history of Acadia, which is noticed by Charlevoix and others, and which had a considerable influence on the affairs of that country, at a time when it formed part of New France, and included a large portion of the present Province of Lower Canada.—The contentions between La Tour and D'Aulnay are largely detailed by Charlevoix, and by Haliburton in his recent history, and the records of this Province contain a notice of them, in the commission granted by the king of France to Monsieur Denys. They were at length settled by the family compact, of which this paper is the evidence.—The following are the historical facts connected with the subject:

In 1627 Claude St. Etienne de La Tour had obtained a grant of the country on the river St. John.

In 1630 Sir Wm. Alexander sold his right and title in Nova Scotia, (except Port Royal, now Annapolis,) to

La Tour, who was then settled on the river St. John, to be held by him of the Crown of Scotland.

After Claude de La Tour's death, his purchase from Sir Wm. Alexander was confirmed, by Louis XIII, to his eldest son Charles St. Etienne de La Tour, (the person mentioned in this contract of marriage;) who also obtained in 1634, as Mr. Haliburton states in his history of Nova Scotia, a grant of the Isle of Sable, ten leagues on the sea coast, and the same extent inland, at La Hêve; and a grant of as much at Port Royal and at Minas, with the adjacent islands.

But, La Tour being a Huguenot, Monsieur de Razillai was commissioned and sent out as Lieutenant General of Acadia, after the peace of St. Germains in 1632; and the province was divided between him, and Mons. Denys,—and La Tour, who obtained for his share, according to Charlevoix,* that part of the province of Nova Scotia which extends from Annapolis to Cançeau, while Razillai had Port Royal and all to the southward as far as New England.—But Razillai, by an arrangement with La Tour, obtained La Hêve, which lies within the limits assigned to the latter.

After the death of Razillai, Charles de Menou, Sieur D'Aulnay, de Charnisai, obtained possession of his property and government by an agreement with his brothers.

In 1638, the king of France, by a letter to D'Aulnay, defined the limits of the respective possessions of himself and La Tour, assigning to the latter all that part of Acadia lying to the west of a line drawn from the centre of the Bay

* This partition, however, is questioned by the writer of an able pamphlet published in London in 1754, apparently with the sanction of the British Government, intituled, "*The conduct of the French with regard to Nova Scotia;*" in which the question of boundary between Canada and Nova Scotia, as it then stood, is handled with much acuteness.

of Fundy to Cape Cançeau,—and to D'Aulnay all the rest of Acadia to the boundaries of New England. But, D'Aulnay was allowed to retain La Hêve and Port Royal, which were within La Tour's portion, and the latter was to keep the port on the river St. John, which was within the limits assigned to D'Aulnay.

Difficulties, however, having arisen between them, D'Aulnay, in 1641, got an order from the French King to arrest La Tour. The contests between them are given in detail by Charlevoix, and still more fully by Mr. Haliburton in his history.

In 1647 D'Aulnay obtained a confirmation from Louis XIV. of the government;—among other considerations, for having expelled La Tour from the fort of St. John, which "he held in rebellion in favour of foreign religionaries,"—namely, the Protestants of New England.

In 1651, La Tour, who, after many disasters and vicissitudes, had gone to Hudson's Bay, returned from thence on hearing of the death of D'Aulnay,—embraced the Roman Catholic faith,—was made Lieutenant General of the King of France in Acadia, and afterwards, in 1653, married the widow of D'Aulnay.

The original contract of this marriage was, in 1813, in the possession of Bénoni D'Entremont, Esq., of the Acadian Settlement of Pubnico, (formerly called Poboncoups,) on the S. W. coast of Nova Scotia,—the great grandson of Charles St. Etienne de La Tour. In the summer of that year, a gentleman in Nova Scotia, who was then collecting materials for a history of that Province, sent the original contract to a person in this Province, with a request that it might be deciphered and translated. The paper now presented to the Literary and Historical Society, is a copy

then made from the original, which was returned to Mr. D'Entremont.

That gentleman, who was still alive in 1828, when Mr. Haliburton published his history, was probably the son of the Monsr. D'Entremont who is mentioned by Hutchinson in his history of Massachusetts as a descendant of La Tour. This person was removed to Boston in 1755 or 1756, when the Acadians were sent away from Nova Scotia, and died there some years after. Hutchinson states that he had claimed at one time a great part of Nova Scotia and L'Acadia, under grants made to La Tour, and the confirmation thereof and other titles vested in him.

ARTICLES DE MARIAGE ACCORDÉS ENTRE MR. CHARLES DE ST. ETIENNE, SEIGNEUR DE LA TOUR, CHEVALIER DES ORDRES DU ROI, ET SON LIEUTENANT GÉNÉRAL DANS L'ACADIE, PAYS DE LA NOUVELLE FRANCE, D'UNE PART, ET DAME JEANNE MOTTIN VEUVE DE FEU MR. CHARLES DE MENOU, CHEVALIER, SEIGNEUR D'AULNAY, EN SON VIVANT AUSSI LIEUTENANT GÉNÉRAL POUR LE ROI, DANS TOUT LE DIT PAYS D'ACADIE, D'AUTRE PART.

Premièrement le dit Seigneur Chevalier de La Tour prendra pour sa femme et légitime épouse Madame d'Aulnay avec tous ses droits et effets, lesquels droits le dit Seigneur futur époux consent être séparés de leur future communauté entre Messieurs les enfans mineurs de la dite Dame, future épouse, le Séminaire, et icelle Dame, ainsi que la chose a été avant le prétendu mariage, jusqu'à l'entier paiement des dettes créés du vivant du dit feu Seigneur d'Aulnay et depuis son décès jusqu'à l'heure de maintenant, comme aussi de celles qu'il conviendra créer ci-après pour bien et utilité

de la société d'entre les dits Seigneurs mineurs, le Séminaire et la dite Dame, après lequel payement et dernier sol de toutes les dettes, elle prendra sa part des biens de l'association au *prorata* de ce que lui en appartiendra, et qu'elle y aura contribué de ses droits et prétentions, lesquels pour lors entreront en leur dite future communauté.

Sera fait Inventaire général et partage avec les associés sans distraction pourtant d'aucun fonds mais pour l'éclaircissement des droits et prétentions des dits associés ; En suite de quoi sera mis un économe du consentement des parties pour l'administration des effets de la dite société, lequel aura soin et sera tenu annuellement de rendre compte des fruits et revenus d'icelle ;

Monsieur de La Tour déclare présentement ne prétendre recevoir ni admettre aucune chose des susdits droits et effets de Madame d'Aulnay sa future épouse jusqu'à l'entier payement des dettes universelles de la société ; Aussi le dit Seigneur de La Tour ne sera-t-il chargé d'aucunes des susdites subventions et obligations de la compagnie ni même le bien et les avantages qu'il fait à la dite Dame sa future épouse en faveur de leur mariage, lesquels il veut lui appartenir et être conservés francs et quittes de tous troubles et obligations.

Le dit Seigneur de La Tour donne à la dite Dame d'Aulnay sa future épouse en considération de l'amour qu'il lui porte la somme de *trente mil livres tournois*, de laquelle vingt mil livres demeureront en propre à la dite Dame et aux siens de son côté et ligne *à percevoir et prendre sur le fort et habitation de la Rivière St. Jean, ses appartenances et dépendances*, et les dix mil livres restantes entreront en la dite future communauté ;

Le dit Seigneur de La Tour a doué et doue la dite Dame future épouse, sa vie durant seulement, *de la propriété du dit*

fort et habitation de la Rivière St. Jean dans toute son étendue, tout aussi que le dit Seigneur future époux le possède sans en rien réserver ni diminuer avec tous les droits de traite, fruits, revenus, émoluments, provenant tant du dedans d'icelle Rivière que des Isles et côtes adjacentes, que le dit Seigneur promet faire valoir.

A l'égard de Messieurs les enfans mineurs du premier lit du dit Seigneur de La Tour, *il leur laissera pour leur subsistance le Cap de Sable avec toutes ses appartenances*, comme aussi tous et uns chacuns les biens qui lui peuvent advenir et appartenir par succession de l'ancienne France.

Avenant le décès du dit Seigneur futur époux avant celui de la dite Dame future épouse, le dit Seigneur de La Tour futur époux déclare vouloir et entendre que tous et uns chacuns les biens, meubles, armes, munitions de bouche et vivres avec toutes marchandises de traite et pelleteries qui se trouveront lors de son décès dans ses magasins et autres lieux, soit en la Nouvelle ou Ancienne France, ayent à appartenir et appartiennent à la dite Dame future épouse, comme étant le bien propre de leur communauté, soins et travaux, à laquelle dès à présent il en fait donation pure et simple, toutes dettes de leur dite future communauté préalablement payées, sans préjudice à l'article cy-dessus de son douaire.

Et pour changer une clause qui était nécessaire pour assurance de la dite Dame des susdits articles, le dit Seigneur de La Tour a bien voulu pourvoir à la dite sureté de la manière ci-après, savoir, qu'en cas de contravention et qu'il fut fait obstacle de la part des enfans ou héritiers du dit Seigneur futur époux à la dite Dame future épouse en la perception des dits fruits, usage de droits, et autres revenus et émoluments, à elle cy-devant accordés par donation pour douaire,

le dit Seigneur de La Tour, persévérant et voulant absolument que la dite Dame jouisse réellement des effets des présents articles de mariage, et en punissant les dits contrevenants,déclare dès à présent qu'il lui donne,à elle et aux siens, le fonds, à pur et plein, *du fort, habitation et Rivière St. Jean dans toute son étendue, et privilège selon ses concessions*, et veut qu'en tant à lui est, que la dite Dame s'en fasse pourvoir par toutes voies de justice.

Arrivant que de quelque autre part étrangère il fût fait empêchement à la dite Dame future épouse à l'exécution et jouissance des susdits articles, le dit Seigneur futur époux pour ôter tout ombrage et occasion de mauvaise intelligence, veut que les enfans ou hoirs se joignent en cause avec la dite Dame pour la faire jouir, après en avoir été par elle de ce interpellés,à quoi résistant et refusant,il les prive comme dessus, du dit héritage fonds et revenus de la Rivière St. Jean, et cede le tout à la dite Dame et aux siens.

Touchant les gages et appointements des officiers soldats matelots, serviteurs, et domestiques actuellement dans le service, il sera pourvu à ce qu'ils soient annuellement payés et satisfaits, suivant quoi la dite Dame, advenant le decès de son dit future époux, promet et s'oblige de payer les appointements et gages de l'année qui sera pour lors courante, sans s'obliger à d'avantage, et ce des marchandises et pelleteries qui se trouveront dans les magasins au jour du decès du dit Seigneur futur époux.

Le dit Seigneur de La Tour futur époux promet et s'oblige de maintenir et conserver de tout son pouvoir, Messieurs les enfans mineurs de la dite Dame dans la possession de tous et uns chacuns leurs droits et concessions conformément aux tîtres et provisions qu'ils en ont, desquels sera donné communication au dit Seigneur de La Tour, et

copies, comme respectivement fera le dit Seigneur de La Tour des siens à la dite Dame d'Aulnay sa future épouse pour sureté des conditions cy-dessus.

Quant à Messieurs les enfans mineurs, tant d'une part que d'autre, a été conclu que ceux de Monsieur de La Tour seront nourris et entretenus aux dépens de la future communauté pendant leur minorité, et en cas de mort du dit Seigneur de La Tour, la dite Dame promet que (jouissant paisiblement et tranquillement de son dit douaire donation et autres droits,) d'assister suivant son pouvoir et au mieux qui lui sera possible, les dits enfans mineurs de son futur époux pendant leur minorité; Et ceux de la dite Dame future épouse seront aussi nourris et entretenus durant leur minorité soit en ce pays de la Nouvelle France que de l'Ancienne, aux dépens et sur le revenu et fonds de la société subsistante entre le Séminaire, la dite Dame leur mère, et les dits Seigneurs mineurs, le tout gratuitement sans que la dite Dame d'Aulnay leur mère, leur en puisse faire ou faire faire aucune demande, à quoi le très Révérend Père Léonard de Chartres Vice Prefet et Custode de la Mission, joint avec les très Révérends pères et frères Missionaires, tous ensemble faisant forts des très Révérends pères de la Province de Paris, a consenti et consent pour l'intérêt du dit Séminaire en considération et pour le respect qu'il porte à la mémoire de feu Monsieur d'Aulnay, comme aussi pour l'amour et bienveillance particulière qu'il conserve en faveur de ses mineurs.

Sera loisible à la dite Dame d'Aulnay pour sa satisfaction de retenir auprès de soi et avec elle tels et tel nombre de ses enfans qu'il lui plaira à condition qu'ils y seront nourris et entretenus pendant leur séjour aux dépens de la future communauté du dit Seigneur de La Tour et de la dite Dame.

Etant procréés enfans du dit mariage ils partageront éga-

lement avec ceux du premier lit du dit Seigneur de La Tour, tant de la Rivière St. Jean, Cap de Sable, qu'autres biens qui pouvaient appartenir à icelui Seigneur de La Tour, soit en la Nouvelle France, qu'en l'Ancienne par succession, donation ou autrement, et respectivement de la part de la dite Dame future épouse suivant la coutume et vicomte de Paris.

Les dits Seigneurs de La Tour et la dite Dame d'Aulnay, future épouse pour parvenir aux fins et principal dessein de leur prétendu mariage, qui est la paix et tranquillité du pays et la concorde et union entre les deux familles, veulent et désirent en tant qu'à eux est, qu'à l'avenir leurs enfans contractent nouvelle alliance de mariage par ensemble.

Fait et passé au fort du Port Royal le vingt-et-quatrième jour de Février, mil six cent cinquante-et-trois, en présence des parties et témoins qui ont signé la minute des présentes.

(Signé.)

Charles de St. Etienne, et Jeanne Mottin, St. Léonard de Chartres, Vice Prefet et Custode de la Mission, Frère Jean Desnouse St. François Marie, J. Jacquelin, Prevost de St. Martin, Laverdure, et Bourgeois, Témoins.

ART. XI.—DESCRIPTIVE SKETCH OF* ST. PAUL'S ISLAND, AT THE ENTRANCE OF THE GULF OF ST. LAWRENCE.

BY MR. ADAMS.

READ 5TH FEBRUARY, 1831.

I beg leave to present to the Literary and Historical Society some brief notices on the subject of St. Paul's Island, which I had occasion to visit last summer in my professional capacity as Architect, for the purpose of ascertaining the most eligible site for a Light-House, to be there erected, at the joint expence of Lower Canada and New Brunswick. The party appointed were supplied with every document relating to the Island which could be obtained, particularly with one of much value to them drawn up by Mr. Jones, of the Royal Navy. They sailed from Quebec in the month of June, 1830, in the hired Government Brig Kingfisher, and having touched at Miramichi, they afterwards proceeded direct to St. Paul's Island, and disembarking there on the 14th of July, commenced their investigations on the same day.

The Island of St. Paul is a mass of Granite rock, about 2½ miles long and one mile broad; it is situated between Newfoundland and the Northern extremity of Cape Breton, directly in the route of ships sailing to and from the gulf of

* The Latitude and Longitude of St. Paul's Island, as taken by the Officers of H. M. S. Hussar, are as follows:—

Lat. 47°, 12′, 38″, N.
Long. 60°, 11′, 24″, W.
Varn. 23°, 45′, 00″, W.

Vide Mr. Adams's Paper p. 242.

St. Lawrence. On all sides it is surrounded by cliffs nearly perpendicular, with deep water to their very bases; so that vessels, unaware of their dangerous proximity, during the dense fogs peculiar to that part of the ocean, may run against these cliffs, in most places, without previously striking upon sunken rocks, or grounding; and thus be dashed at once into fragments. And it is but too well ascertained that many such disasters have there taken place, attended with melancholy loss of human lives. For, in such casualties, small is the chance of escape;—even should the unfortunate mariners be enabled by some means to scale the cliff and attain the summit, yet, during six months in the year, their escape would probably only be from one mode of dying to another yet more appalling and miserable,—to perish by cold and hunger. On one part of the Island, very near the site of our encampment, lie the remains of seventeen persons huddled together in one grave, who sailed in a vessel from Miramichi some years ago late in the fall, and, after effecting a landing, there perished. This unfortunate event was first made known by the circumstance of a number of watches being offered for sale at Halifax, by a person known to be a wrecker; on the paper of one of which was written a kind of diary by its owner, a young merchant from Miramichi, mentioning the name of the vessel, the date of its wreck, the impossibility of lighting a fire, the number who had already died, and the dreadful death staring the then surviving remnant in their faces. In consequence a vessel was immediately despatched to the Island, where the bodies were all found heaped together, and they were there buried. I did not visit the spot, as it appeared to be very difficult of access, but saw from our boats the remains of two or three upright

poles or oars in a kind of hollow, which we conjectured had been put up with an intention of making some sort of shelter from the inclemency of the weather.

Another vessel, a Transport, having on board a number of troops, I think about the year 1813, struck against the cliffs on the Atlantic side of the Island and immediately parted; the deck remaining for a time almost entire, while the hull and all below sank into deep water. Those who were on deck, it is related, were mostly saved by means of the bow-sprit which projected over a kind of ledge and enabled them to gain a place of safety. Those who had been below were all drowned.

This distressing calamity, it is said, occurred on a Saturday evening, and the gentlemen in the cabin were just preparing to spend a convivial night, rejoicing in the approaching termination of a tedious sea passage, when the ship struck. Captain Rayside, of the Kingfisher, while coasting the Island in his boat, found the remains of what seemed to have been a bow-sprit, a soldier's broken canteen, and part of the number of a transport's boat, of which the figures 8. 0 were distinguishable. These two accidents I have detailed as having, in some measure, come under my own observation from the remains noticed. It is satisfactory to be able to add that all those who had effected an escape from the transport to the rock were afterwards taken off and saved.

The interior of St. Paul's Island is divided into two distinct parallel ranges of hills, which run through nearly its whole length from S. W. to N. E.—Of these ranges that on the eastern or Atlantic side is the highest and is divided into three distinct eminences, sloping down with steep declivity to the water's edge, the centre one of which is

somewhat higher than the other two, and is the spot unanimously selected by the party as the most eligible site for a light-house, should only one be built on the Island.

The elevation above the sea of this highest land is four hundred and forty-three feet, which was determined by a series of levels observed with a good instrument.

There are several small runs of water in the Island, the largest of which is about six feet wide, and flows between the parallel ranges of hills just mentioned; and after passing through two small lakes situated at an elevation of perhaps 300 feet above the level of the sea, falls abruptly into the southern cove of Trinity Bay, so named by our party.

The water is yellowish,—as is that in every part of the Island,—but, I have reason to believe, not unwholesome; and it would afford an inexhaustible supply to shipwrecked persons who might discover it.

The greater part of the Island is covered with a growth of stunted trees, principally of the fir kind, but we saw not one, of which we could make even a flag-staff. On some parts these firs grow in a very singular manner, particularly the balsam or *sapin*. I examined one, which, with a stem at least ten inches thick, rose not more than four feet in height; but was spread over the ground like a great mushroom, occupying a circular space of at least 15 feet diameter. In fact on one occasion, as a short cut, we actually scrambled over the tops of these trees, which I suppose could not be less than of thirty years growth,—but here the soil was unusually scanty. Other parts of the Island are bare of trees, particularly much of the western or gulf side, this is owing to a total absence of soil. Near the centre there are two large naturally clear places, on one of which grows nothing but thick deep moss, while the

other, close by, produces a luxuriant growth of a curious kind of bog grass, intermixed with abundance of that singular marshy plant,* whose leaves somewhat resemble a champaigne wine glass, and which are generally filled with pure water.—This plant is, I believe, vulgarly called "Lunettes au Cochon" by the Canadian. In this last field or clearing, our usual path led us close beside the edge of a small puddle, as it seemed, of very dark water, the surface of which was not twenty feet square; on the day when our line of levels was performed, one of the party, in order to try the depth of the water, plunged down a levelling rod 22 feet in length, and to his great surprize, found no bottom. In our after trips we took especial care to keep farther from this place, as the soil around, on which we walked, from its shaking, evidently consisted of merely a mat-work of roots and fibres resting on water, through which a hole might easily have been broken by some unlucky footstep.

St. Paul's Island appears to be totally destitute of game of any kind,—for the party did not see one four footed animal during their stay there, which was eight days.—Birds, also, excepting sea fowl, are very rare in this most desolate place. We found only a few crows, some little chirping birds of the linnet kind, and one day a very small owl which we disturbed on his roost, and so alarmed by our unexpected approach that he could scarcely find his wings. But in compensation for this scarcity, the ocean around swarms with delicate fish. Induced by this abundance, a person from Nova Scotia had established here, for the first time, a fishery, and we found him in one of the landing

* Sarracenia Purpurea.

places or coves of the Island busily employed. He had nine boats with crews of two men to each, and appeared to be well satisfied with his success; his boats often made three trips a day and returned filled with Cod-fish and Halibut. Besides these there are Mackarel and Herring, which latter they take in nets and use as bait for the Cod. Sometimes, however, these nets were visited by very troublesome customers, for we saw two small sharks about six feet long lying dead on the beach, which had contrived to get entangled, and had almost broken the nets to pieces before they could be got safe on shore. A peculiar species of armed fish which they denominated a Cat-fish, was also very annoying to the fishermen.—I saw one which they had taken, about three feet in length, and its appearance is actually disgusting from ugliness. It had a broad back fin which extended from the shoulders to the tail;—its head somewhat fancifully resembled that of a cat, the mouth was like a bull-frog's, and so entirely filled even to the throat with three rows of strong, short, thick and powerful teeth, that I really think I would rather have accepted a cool bite from either of the sharks we there saw, and whose teeth I examined, than from the uninviting jaws of this lesser umpire of the deep.

As before observed, there are only three coves or indentations round the Island, which can be called landing places; and in none of these can even a boat lie safe in all winds.—Two of these coves are on the gulf side of St. Paul's, and near its south-western extremity, and, into each of these, falls a slender stream of good water.—The third is on the Atlantic or eastern side, but has no shelter whatever from even light easterly gales. All these coves have beaches of fine shingle, and are backed by the steep cliffs which

encompass the Island, but which in each of these places are, with some difficulty, accessible, so that it might even be practicable to convey up light stores out of reach of the water. Besides these three points of access, there may be said to be no other for useful purposes. We minutely examined every cranny round the Island in the ship's launch, and occasionally clambered on the rocks at the bases of the cliffs, but found no shelter. In all these bays and indentations, which are very numerous on the western side, we found remains of former wrecks piled up there high and dry,—deals, staves, pieces of bulwarks, planks of boats, &c. &c. plainly indicative of past misfortunes.

Fogs appear to prevail very frequently, and must be regarded as the greatest natural obstacle opposed to the usefulness of a Light-house in this quarter. Respecting the most usual position and influence of these fogs, as to their density at different elevations, there was some discrepancy of opinion among the members of our party: some of them considering that the lower parts of the Island and of the neighbouring coasts were more frequently and generally visible during such phænomena than the higher regions. From the observations I was enabled to make there and elsewhere, I am inclined to differ from that conclusion, and believe that a strong light at the elevation of 90 or 100 feet above the highest ground, would in most cases, be above the fog altogether, and prove more effectual than one placed lower down. On two occasions, those in the ship, which lay off and on St. Paul's while we remained on shore, assured me that the whole contour of the hill tops was distinctly to be traced in a kind of misty line, while all below was totally enveloped in thick obscureness; and one day whilst on the summit of the highest hill I could plainly

see the neighbouring heights, while the lower parts were invisible; this convinces me that on many occasions the veil of fog is very thin, which clings to these highest parts, while it becomes denser and denser, and spreads out more widely around the land as it approximates to the level of the sea; and I conceive also that these fogs are generally more intense immediately near such Islands as St. Paul's than at a few miles distance. So that a vessel sailing at such distance will often be surrounded by an atmosphere comparatively clear, and be thus enabled to distinguish a light placed on high land in many cases even from the deck. Referring to an instance that may be familiar to many residents at Quebec, I think I may venture to assert that the tops of the Beauport hills are much more frequently visible during summer fogs, than the lower parts of them; and this same appearance I had several times the opportunity of noticing in different parts of the River St. Lawrence: the shores of which, in hazy weather, generally became first visible along their line of summit, while the lower regions still remained enveloped in a dense horizontal mist and quite invisible from the deck of the ship.

All around St. Paul's Island, it may be remarked, that at about three-fourths of a mile distance, the soundings average twenty-five fathoms, gradually shoaling into five; and that, off Trinity Bay, at the southern extremity of the Island, there is a good anchorage at two cables length from the shore in ten fathoms of water, while the wind is from south, and southerly, to north-east.

The granite of which the Island is composed assumes a great variety of appearance, from unequal distributions of the same component minerals; and I am in possession of a few specimens, all broken from the solid cliffs within a

space of twenty yards, which completely illustrate this remark. There is one remarkable appearance of reddish feld spar near the northern end of the Island, which is visible for many miles while approaching from the gulf of St. Lawrence: it consists of three or four bars or strata embedded in the face of the perpendicular cliff, and lying nearly horizontally. These strata are about six feet in depth, and the longest is probably about one hundred yards in extent, and their bright appearance forms a remarkable contrast with the dark face of the main rock whose substance they intersect.

Such are the few remarks which I have ventured to submit to the notice of the Society.—That they are of little consequence I am well aware, unless the circumstance that a considerable sum is likely to be there expended, may invest them with some slight claim to attention.

JOHN ADAMS.

8th January, 1831.

ART. XII.—ON THE TEMPERATURE OF THE SPRINGS AT QUEBEC. BY WILLIAM KELLY, M. D., SURGEON R. N.

READ 1ST MARCH, 1834.

As the water of spring-wells is observed to be colder than the air in summer, and warmer than it in winter, their temperature, which varies little comparatively with the change of seasons, was for a long time supposed to indicate the mean temperature of the countries in which they are situated. The opinion seemed confirmed by finding that such is actually, or very nearly, the case in the temperate countries of Europe, where exact enquiries into the subject were first instituted. But a more extensive experience in different climates has shewn, that it is only in temperate regions that this balance of heat between earth and air actually exists. In very cold climates the mean temperature of the earth is ascertained to be higher than that of the air, whilst within the tropics it is lower. There are some places in each continent where an equality exists, but on proceeding from these towards the equator or the pole, the mean heat of the air or earth is found to preponderate.—Philadelphia seems to be one of the points of equality, in this respect, in North America.

Baron Humboldt has shewn that the Isothermal lines often diverge widely from the parallels of latitude, and the Isogeothermal lines, which designate an equality of temperature in the superficial crust of the earth, vary again from the Isothermal. As the information necessary for

drawing correct Isogeothermal lines is as yet very imperfect, any contribution to our knowledge on the subject will not be altogether useless. Hence, as no account of the mean temperature of the springs in any part of Lower Canada has yet appeared, I venture to submit the following to the Society, notwithstanding its imperfections, with the hope that some one who has better opportunities of observing, may be induced to turn his attention to the subject.

A difficulty occurs in this country in obtaining the temperature of wells throughout the year, as few perennial overflowing springs can be found.—The crust of the earth is soon frozen in the winter, and as no further infiltration takes place, the scanty drainage from deeper sources is frozen as it reaches the surface, if the well is shallow. In deep wells also, which retain a supply all the year round, the water at the surface is generally cooled to the freezing point. Hence it is only by examining the bottom of such wells, that the temperature of the earth, at this season, can be ascertained.

By means of a Six's register thermometer, I ascertained the temperature at the bottom of the deepest wells in the Upper Town of Quebec, in March, April, May, October, November and December of 1831. The same instrument also enabled me to ascertain it in February and March 1832. After this time it got out of order, and could no longer be used for the purpose. I had, however, in the mean time observed a well in the field next the citadel, where the water bubbled up with some force, and issued in a small stream. Its temperature in May, when the ground became bare, corresponded with that of the bottom of the wells in town, and it seemed likely to afford means of ascertaining the temperature of the earth, during the summer months, without any necessity for a register thermometer.

As my absence with the surveying party prevents me from attending to the subject during the summer, or autumn, I applied, in 1832, to my friend, Lt. Baddeley, for his co-operation. He readily promised it, but was prevented by an attack of the prevailing epidemic from obtaining more than two observations. In the spring of 1833, my friend, Dr. Skey, undertook to register the temperature of the well during my absence, and on my return in the fall, he gave me notes both on this well and another in the Artillery Barracks, taken several times each month, and recording every circumstance that could influence the state of the water at the time of the observation.

From the observations of these gentlemen, and those I have previously made, I have endeavored to ascertain the temperature of the wells for each month of the year. I am, however, without any observations in January, and from the want of a proper register thermometer, I cannot now supply the deficiency. But as the temperature of the earth at this season is gradually decreasing, we cannot err much in supposing it to be a mean between that observed in December and February. *

* The two following observations were made in January, 1835.—Their result corresponds very nearly with the mean between December and February of former years. They were made by means of a register thermometer, at the deepest of the wells formerly examined, which is situated behind the Court House.

January 10th, at 11, A. M.—Temperature of the water at the surface (the thermometer, which is sixteen inches long, being just immersed) 35°; at the bottom 40°; air 10°; depth of water 15 feet; depth of well 25 feet.

January 20th, at noon.—Temperature of the water at the surface 35°; at the bottom 40°,5; air 25°; depth of water the same as before. That part of the surface of the well where buckets are let down, was on both occasions covered with loose thin flakes of floating ice, and there was a crust of ice of considerable thickness adhering to the sides of the well, and projecting some distance over the surface of the water.

The following is the temperature of the Springs in each month deduced from the mean of all the observations. The wells are from 180 to 200 feet above the tide waters of the St. Lawrence.

January 40°,5,	May 37°,75,	September 48°,40,
February 39,	June 42,	October 48,
March 37, 75,	July 45, 75,	November 46, 5,
April 37, 75,	August 47, 25,	December 42.

Mean annual temperature 42°, 74.

The variations of the temperature of the earth, at a very moderate depth, present a striking contrast to those of the air. Thus, the earth here is equally warm in June and December. It is coldest in April when the snow, which has lain on it all the winter, begins to disappear; and it acquires its greatest heat in September, from the accumulated effect of the sun's rays, and the infiltration of warm rains during the previous summer. As far as the present observations can be trusted, it at no season sinks materially below the mean annual temperature of the air, whilst its average is from five to six degrees above it.

The temperatures of the earth now stated can only be considered as approximations. The observations, besides being few, have not been continued through all the months of any particular year; nor have they all been made at the same well. In consequence of the first circumstance, we cannot be quite certain of the amount of change in each month, as the temperature would probably vary a little in different years; and the last makes the mean less certain than if it had been obtained by observations at one well only, since the seasons would then bring about a compensation, whether the water which fed the well filtered near the surface, or came from a depth below it. To ascertain correctly the mean temperature of the earth in any place, and its changes during the year, requires a series of observations continued regularly for several years.

ART. XIII.—TRAVERTINE OR CALCAREOUS TUFA.—BY H. D. SEWELL, ESQUIRE, M. A.

READ 7TH FEBRUARY, 1835.

The accompanying specimen of Travertine was taken, by myself, in situ, from a small cove on the American side of the Niagara river, about a mile below the Falls, in which spot it is formed in considerable quantities, by the drip of the Limestone rocks of that district incrusting upon moss.

The great Geological formation of that section of Upper Canada, at least in the neighbourhood of the Falls, is a secondary Limestone containing organic remains,* and rich in Mineral springs. About one hundred yards below the Falls on the Canada side, a Sulphuretted Hydrogen Spring exudes from below the Table Rock, so rich in Sulphur as to deposit a thick slimy incrustation of that mineral on the objects with which it comes in contact, and very sensible to the olfactory nerves of those who pass by it in their adventurous excursion behind the falling sheet of water.—About a mile above the Fall, on the same side of the river, is another Spring of Carburetted Hydrogen, so pure and so copious that it readily ignites and burns with a large, brilliant, white flame, and might be applied to all the purposes of coal-gas. I had no opportunity of seeking for springs on the American side of the river, but as the strata are the same, I have no doubt they exist.

* Among the organic remains may be enumerated,—Encrinites, Ammonites, and Favosites. The Mineral contents are Columnar Limestone, Snowy Gypsum and Yellow Blende. This latter is found at the Whirlpool immediately opposite the formation of Travertine.

All travertines are formed from the deposits of water highly impregnated with Carbonic Acid, which has the property of dissolving the Calcareous matter of the rocks through which it percolates.—Rain water has a similar property, but independently of this, it appears to me that Carbonic Acid gas is formed in the Niagara Limestone and is taken up by the water. The Calcareous matter is supplied from the rock, and on coming into contact with the external air, is deposited on the moss of the old Limestone, to the growth of which it materially contributes. A new rock, also a Carbonate of Lime, is thus formed, rough and coarse, but highly useful as a building material, where, as in Italy, it is deposited in large quantities.

Most of the public buildings in Rome and its vicinity are formed of this material.—Among which we may enumerate those splendid edifices, rivals alike in magnitude and magnificence, the Coloseum and St. Peter's, the former the pride and wonder of the ancient, the latter of the modern world. The Temples of Pæstum, so ancient as to be venerable as antiquities, (before the Christian Era,) are also built of this everlasting rock.—The corroding hand of time seems to have no effect on this enduring material. The lapse of centuries which has crumbled the cement used in these buildings into dust, and formed from it a luxuriant soil for the growth of parasitic plants, has left the edges of the Doric fluted columns as sharp as when they issued from the Sculptor's chisel. No moss upon the surface of the stone itself proclaims the many hundreds, I may say, thousands of years which have passed by since first the Grecian architect raised on the foreign strand of Italy these temples of colossal magnitude.—But for the destructive hand of man we, of the nineteenth century, might have

contemplated these buildings, in the same perfect beauty in which they appeared to Augustus Cæsar.

Calcareous waters have been applied in Italy, at the Baths of San Filippo to the formation of very beautiful medallions, one of which, a fine specimen, was lately presented to the Museum, by a member of this Society. The formation of these medallions is thus described by Mr. Lyell :—"There are here (San Filippo) three warm springs containing Carbonate and Sulphate of Lime and Sulphate "of Magnesia. The water which supplies the bath falls "into a pond, where it has been known to deposit a solid "mass of stone, thirty feet thick in twenty years. It is from "these waters that the manufactory of medallions in basso "relievo is carried on. The water is conducted by canals into "several pits, in which it deposits travertine and sulphate "of lime. After being thus freed from its grosser parts, it "is conveyed, by a tube, to the summit of a small chamber, "and made to fall through a space of ten or twelve feet. The "current is broken in its descent by numerous cross sticks, "by which the spray is dispersed around upon certain "moulds, which are rubbed slightly over with a solution of "soap, and a deposition of solid matter like marble is the "result, yielding a beautiful cast of the figures formed in "the mould. The substance deposited is a calcareo-mag-"nesian compound, of a similar composition to the dolo-"mite of the North of England, but much purer." A similar deposit is found in Rome, on the walls of "Le Sette Sale," probably in ancient time a reservoir for the water which supplied the baths of Titus; there are there three distinct depositions of carbonated lime. The reservoirs are nine in number and of an immense size, and convey a tolerable idea of the magnificence of the baths they supplied.

We need not go far for the origin of this last named deposition. The waters for the supply of ancient Rome were conveyed to the city by aqueducts, from the Appenine Mountains,—the waters of which locality are highly impregnated with calcareous matter, and deposit annually in their course immense quantities of travertine.—Some of these aqueducts were of great extent—the length of one, under the modern name of "*Acqua felice,*" being computed at 22 English miles, and that of the Acqua Paulina at 30 miles.—The water in this long course would naturally deposit its grosser particles, while those of a less specific gravity would be retained to the last, and become incrusted on the walls and bottom of the reservoirs.

The waters of the Anio, the "Præceps Anio" of Horace, are highly impregnated with this calcareous matter, which it has deposited in vast masses and in concentric circles. The foam of the cataract of Tivoli forms beautiful pendant stalactites—but on the sides of the deep chasm into which the cascade precipitates itself, there is seen an extraordinary accumulation of horizontal beds of tufa and travertine from 400 to 500 feet in thickness. A very remakable instance of the deposition of this peculiar rock occurs in the Campagna di Roma, on the road to Tivoli, at the Lago di Solfatara, into which a small stream of tepid water flows continually from a smaller lake, a short distance above it. This water is highly impregnated with carbonic acid, which escapes from it in such quantities that in some parts the waters appear to be boiling. Sir Humphrey Davy states, in one of his last works, "that the water taken from the "most tranquil part of the lake, even after being agitated "and exposed to air, contains, in solution, more than its "own volume of carbonic acid gas, with a very small

" quantity of sulphuretted hydrogen.—Its high tempera-
" ture, which is pretty constant, at 80° Fahr. and the quan-
" tity of carbonic acid it contains, render it peculiarly
" fitted to afford nourishment to vegetable life. The banks
" of traventine are every where covered with reeds, lichen,
" confervœ and various kinds of aquatic vegetables—and,
" at the same time that the process of vegetable life is
" going on, the crystalization of the calcareous matter,
" which is every where deposited in consequence of the escape
" of carbonic acid likewise proceeds." There is, he continues, "no place in the world where there is a more strik-
" ing example of the opposition or contrast of the laws of
" animate and inanimate nature, of the forces of inorganic
" chemical affinities and of those of the powers of life."

The stream which flows from this lake fills a canal about nine feet broad and four deep, and may be traced along the Campagna to its junction with the Tiber, by a long line of vapour which rises from its milky waters.—It deposits travertine in this channel.

The growth of Stalagmites and Stalactites in caverns and grottos is another familiar example of calcareous precipitates.*

This interesting subject might be carried to a much greater extent, but I leave the discussion of it to those who are better skilled in the science of geology than myself.—I should not indeed have trespassed at all upon the time of this Meeting, but from an anxious desire as an officer of

* There is another rock called Tufa which is not calcareous, and owes its origin wholly to volcanic action, being in reality a norous lava. This rock, though bearing a similar name, is easily distinguished from the rock we have been describing.

this Society, of acting up to a suggestion made at a late meeting of the Class of Natural History, and by which as Curator of the Museum, I am peculiarly bound, viz. to offer at each meeting, a short description of such donations as may be presented to the Society, in the hope of exciting a greater degree of interest among the members.

ART. XIV.—CANADIAN ETYMOLOGIES.

BY ANDREW STUART, Esq.

READ 2D MARCH, 1835.

CANADA,—pronounced by the French descendants Kanudaugh or Canadâ.

The Spanish Etymology of this name is admitted on all hands to be inadmissible.

It is said that the Europeans upon their first coming to this part of the continent being uniformly told by the straggling Indians, whom they met, that these natives were going to Canada or Canata, that is, to the village, were led to believe that such was the name of the whole country;—and this, I believe, to be the true origin of the name.

In many of the Indian tongues of this continent, the mode of compounding words differs from that generally used in the Latin and Greek languages.

A syllable is taken by the North American Indian from each of the words which constitute the elements of the compounded word.

Thus the word Ca-na-dâ contains probably a syllable taken from each of three words, which united convey the idea of a village.

The following Etymology of the Latin word *Cadauèr* as given by an agreeable French traveller in his "Soireés de St. Petersbourg," will give a sufficiently accurate notice of the Indian mode of compounding words:—Caro-data-Vermibus. Several other examples of the same mode of

compounding Latin words is given by this writer;—as,

Magis-volo	*malo.*
Non volo	nolo.
Cœcus-ut-ire	Cœcutire.
Magis-aucte	Macte.
Uterque	unus alterque.
Negotior	ne-ego otiôr.
Oratio	os-ratio.
Nihil	ne hilum.
Nemo	ne homo.

The roots of the word Canada are to be found in the names of several Indian villages.—Thus, Kâ-na-wâ-ga, or Kaugh-na-Waugha, opposite Lachine, in Lower Canada, means the Village of the Rapids. There is in the Genesee Country—-Kâ-na-dâ-gua—-(Canadaigua)—where the last syllable probably conveys the notice of some peculiarity belonging to that spot or rather village.

In the Mohawk Country we have Ka-na-jo-harie; (Canajoharie), and I have no doubt that upon looking over a list of Indian names of places, one or more of these roots would be found, as in English names of places the concluding syllable *ton*, for *toun*, is often found; or *poles* in Greek names of places; or Ville in French ones, as *Abbeville*, &c. Mr. Duponceau, in the Transactions of the Phylosophical Society of Philadelphia, offers, in confirmation of this origin of the name Canada, the fact, that in the Translation of the Gospel of St. Matthew into the Mohawk tongue, by the celebrated Indian Chief, Brant, the word Canada is used in this sense.

Quebec.—The origin of the name Quebec, from the exclamation of a French sailor, on his ship turning Point Levy, is of the same stamp as that of Canada from the exclamation of a Spanish sailor.

But is the name Quebec an Algonkin word, as pretended by some, signifying "the place of the Streights"? At first sight, there are two reasons which would make me hesitate to believe that Quebec is an Algonkin word. The Algonkin is the softest of the Indian Dialects. Quebec is a dissyllable—the Indian names of places being generally compounds descriptive of some peculiarity of the place, are almost always polysyllables. Such will be found to be all the names of places in the Saguenay and the St. Maurice Counties, hereafter given from the Montagnais Indians, whose language is the Cree or Chippeweyan.—It is thought that it would not be possible to find any word in that language with a short abrupt termination like *bec*. Analogous in sound to the Chippeweyan names of places is the Huron name of Quebec, *Tiatontarili*, which does signify the place of the Streights. One of the Roots of this last word is *ontare*, a Lake, whence is derived the name of Lake Ontario, signifying a great Lake. The village designated by the name "Quebec," was probably immediately above Cape Diamond, where the St. Lawrence becomes exceedingly narrow. The older name of *Stadaconi* seems to have been applied to a village situated some where near the embouchure of the St. Charles, at the foot of what is now called the *Côte d'Abraham*.

I am inclined to believe that Quebec is a French name.

The termination *Bec*, is not unfrequently found in the names of places in Normandy, whence a great number of the first Emigrants to Canada came, signifying a Cape or Promontory.

Men abandoning their own country and settling in a new uncultivated one, are for obvious reasons, apt to transfer the names of places in the old country to their new

seats, as is abundantly exemplified by any general map of North America: and the probability is, that the name of Quebec has been transferred from some, perhaps now, obscure place in Normandy to what is at present the Capital of British North America. This conjecture derives strong confirmation from the Seal of the Earl of Suffolk, one of the Captains of our Henry the Fifth, in his French Wars, having the word Quebec inscribed on it as we now write it.—(Edmonstone's Heraldry.) A place in France of this name was probably the scene of some of his exploits, and the village or town itself may have been given as a reward for the military exploits of this Captain.

The following are some of the notices of the Etymologies of these two words, extracted from other French writers.

ETYMOLOGIE DE CANADA.

La Baye des Chaleurs est la même que l'on trouve marquée dans quelques Cartes sous le nom de Baye des Espagnols, et une ancienne tradition porte que les Castillans y étoient entrés avant Cartier, et que n'y ayant apperçu aucune espèces de mines, ils avoient prononcé plusieurs fois ces deux mots *Aca Nada*, ici rien, que les Sauvages avoient répétes plusieurs fois aux François, ce qui avoient fait croire à ceux-ci, que Canada étoit le nom du Pays. (In a note at the bottom of the page.) Quelques uns dérivent ce nom du mot Iroquois *Kannata*, qui se prononce *Cannada*, et signifie un amas de Cabannes.—*Charlevoix*, *vol.* 1, *p.* 9.

Et pour regard du nom de Canada tant célébré en Europe, c'est proprement l'appellation de l'une et de l'autre rive de cette grande Rivière, à laquelle on à donné le nom de Canada, comme au Fleuve de l'Inde, le nom du peuple et de la Province qu'il arrose. D'autres ont appellé cette

Rivière *Hochelaga* du nom d'une autre terre que cette Rivière beigne audessus de St. Croix (la petite Rivière St. Charles) où Jacques Cartier hyverna. Or jaçoit (encore que) que la partie du Nord audessus de la Rivière du Saguenay, soit le Canada du dit quartier, toutefois les peuples de Gaschepé et de la Baie de Chaleurs qui sont environ le 48e. degré de latitude sud de la dite Grande Rivière, se disent *Canadaquea*,(ils prononcent ainsi) c'est-à-dire *Canadaquois*, comme nous disons Souriquois et Iroquois, autres peuples de cette terre. Cette diversité a fait que les Géographes ont varié en l'assiette de la Province de Canada, les uns l'ayant située par les 50, les autres par les 60 degrés. Cela présupposé, je dis que l'un et l'autre côté de la dite rive est *Canada*, et par ainsi justement icelle Rivière en porte le nom, plutôt que de *Hochelaga*, ou de Saint Laurent.

Ce mot donc de *Canada* étant proprement le nom d'une Province, je ne puis m'accorder avec le Sieur de Belle-Foret, lequel dit qu'il signifie Terre ; ni à peine avec le Capitaine Jacques Cartier, lequel écrit que Canada signifie Ville. Je croy que l'un et l'autre s'est abusé, et est venue la déception de ce que (comme il falloit parler par signes) quelqu'un des François interrogeant les Sauvages comment s'appelloit leur pays, lui montrans leurs villages et cabannes, ou un circuit de terre, ils ont répondu que c'étoit *Canada*, non pour signifier que leurs villages ou la terre s'appellassent ainsi, mais toute l'étendue de la Province.—*Lescarbot, Livre 3, p. 229 et 230.*

ETYMOLOGIE DE QUEBEC.

Québec, Ville Capitale et Evêché de la Nouvelle France, est située au 46e. deg. 55m. de latitude Sept. Sa longitude Est de 307 min. Il est apparent que l'Etymologie de son nom provient de ce que les Normands, qui étoient avec

Jacques Cartier, à la première découverte de la Nouvelle France, appercevant au bout de l'Isle d'Orléans, dans le sud-ouest, un Cap fort élevé qui avancoit beaucoup dans le Fleuve, s'écrièrent *Quel Bec ;* et qu'à la suite du temps le nom de Québec lui a resté. Moreri se trompe donc fortement, lorsqu'il avance dans son Dictionnaire, que cette Ville se trouve ainsi nommée de la hauteur de sa Montagne, parceque, dit cet auteur, les Sauvages appellent Québec, les hauteurs ou élévations de terrein. Ce qui me paroit faux, d'autant plus que m'étant informé par curiosité de l'étymologie de ce nom, aux Sauvages mêmes avec qui je me suis trouvé dans la suite et qui possédoient différentes langues barbares, ils me répondirent que le nom de Québec étoit François ; qu'ils ne connoissent aucun mot sauvage qui sonnât de cette façon, et qu'ils savoient bien, que les Algonquins, les Abénaquis, les Iroquois, et les Hurons appelloient autrefois cette Montagne *Stadaka.* C'est, sans doute, dans le tems que les François vinrent s'y établir en 1608. Cent ans après sa découverte, et qu'ils changèrent un petit amas de Cabannes Sauvages qui y étoient, en maisons beaucoup plus solides.*—*Lebeau,* 1*er. vol. p.* 71 *et* 72.

Nous n'avons point de connaissance de l'étymologie de Québec. Les Sauvages qui y habitoient, lorsque les François vinrent s'y établir, l'appelloient *Stadaka.* On tient que les Normands qui étoient avec Jacques Cartier à sa première découverte de la Nouvelle France, apparcevant au bout de l'Isle d'Orléans, dans le sud-ouest, un Cap fort élevé qui avançoit dans le Fleuve s'écrièrent *Quel Bec,* et qu'à la suite du tems le nom de *Québec* lui est resté. Je ne suis pas garant de cette Etymologie.—*Lapotherie,* 1*er. vol. p.* 230.

* Le Beau arrived at Quebec on the 16th June, 1729, and left the country in March, 1731. He appears to have been employed whilst here, as a Clerk in the office of the Intendant.

Trouvant un lieu le plus étroit de la Rivière, que les Habitans du pays appellent Québec, j'y fis bâtir et édifier une habitation et défricher des terres et faire quelques jardinages.—*Champlain, livre 3e. p.* 115.

Ce Fleuve (le St. Laurent) jusqu'à l'Isle d'Orleans, c'est-à-dire, à 110 or 112 lieues de la mer, n'à jamais moins de 4 à 5 lieues de large; mais audessus de l'Isle il se retrécit tout à coup de telle sorte, que devant Québec il n'a plus qu'un mile de largeur; c'est ce qui a fait donner à cet endroit le nom de Quebeco, ou Québec, qui en langue Algonquine signifie retrécissement. Les Abénaquis, dont la langue est une dialecte Algonquine, le nomment *Quelibec*, qui veut dire ce qui est fermé, parceque de l'entrée de la petite Rivière de la Chaudière, par où ces Sauvages venaient à Québec du voisinage de l'Acadie, la pointe de Lévi, qui avance sur l'Isle d'Orléans, cache entièrement le Canal du Sud; l'Isle d'Orléans cache celui du Nord, de sorte que le Port de Québec ne paroit de là qu'une grande Baye.—*Charlevoix, 3e. vol. p.* 70.

Comme le dit Jacques Cartier fut monté avec ses navires jusques à l'Isle de Bachus, nommée pour le jourd'hui Isle d'Orléans, étant un peu plus avancée vers l'Ouest, il rencontra un port fort commode, où il mouilla l'ancre, et lui donna le nom de St. Croix (La petite Rivière St. Charles) où pour lors les Sauvages avoient une habitation et un village nommé *Stadaka* ou *Stadacone.—Laet, livre* II. *p.* 46.

Tadoussac.—The first naval station of the French was the Island of Coudres, and the first settlement attempted at the mouth of the Saguenay. The Indian name of the Island of Coudres, (as I learn from the Huron Indians of Lorette,) is *t'hadoushah*—expressing the idea of a tortoise encircled with running water. The settlement and the naval

station near it would, in so extensive a country, be known by the same name, and with very slight corruption, it would become *Tadoussac*. It is not known by this name by the Indians inhabiting that quarter. They call it by a name, in their language, signifying the place where the waters issue.—I may add here, that the word *Kakona*, the name of an Island below Kamouraska, signifies, also, a tortoise.

SAGUENAY.—The Indians of this River do not know it by this name. It is probably a Huron word, as I find a Bay of this name at the foot of Lake Huron. The Montagnais name for this River is Mat-cha-se-be, (Mississippi.) It is remarkable that we find this name in such a variety of places separated by great distances.

The following is a List of Indian names in the Cree Tongue, from Tadoussac to Lake St. John, and thence by the River Assuapmousoin to the most northern line of waters to the head waters of the River St. Maurice, and through the St. Maurice to Three Rivers :—

Chicoutimy River,	signifying, further on it is still deep.
Tsinogomy Lake,	Long Lake.
Tsinogomitsisch Lake,	The Lesser Long Lake.
Kasushikeomi Lake,	Lake of Clear Water.
Pashikaouinanishdushihi,	River of Alder.
Koushpigan,	signifying a place which is ascended.
Metabishouan River,	The place where the course of the water ends.
Ouiguatshouan River,	Do you see the Falls there? a carrying place must be crossed.
Ouiguatshganish River,	A small ascent,

Assuapmousoin River,	Place where the Elk is laid wait for.
Péribonea River,	The Curious River.
Mistassini River,	The Large Rock.
Nicouta River,	Swampy places.
Metawenanish River,	The Crooked River.
Chacanaka Lake,	The Rocky Lake.
Temiskaming Lake,	Very Deep Lake.
Micouashah River,	Red Carp River.
Ash Katsi Lake,	The Rocky Lake.
Kapistetsouin Lake,	The Lake of Foam.
Tsimouskoumino Shapaigan,	The Lake of the Old Man.
Kaouashikami,	The Lake of Clear Water.
Miscashi,	The Point of Rock.
Ouashoutaoucka Lake,	Sand Banks.
Metabellottine,	The River of Winds.
Kapemitsigama,	Cross Lake.
Koushapashiganushipi,	The River of Juggling.
Caribash River,	of the Ribband.
Raman River,	Vermillion.
Kaouibushka River,	Burnt.
Uakapah-ushtik Rapid,	The Crooked Rapid.
Mishtniash,	The Large Point.
Pakouapaustik,	Flat Rapid.
Tutushepi or Nabot River,	Milk.
Mishtaruéaushipi, River,	The great Tail of the Beaver
Ushabatshuan,	The current too strong to be passed.
Ashtorogami River,	Place where the Canoes are made.
Utsaht ushipi,	River of Rats.
Pé-o-a-busk,	Carrying place of Iron.

For the following Etymologies of the names of places in the Southern Peninsula of the St. Lawrence and of Quebec, I am indebted to the Journal kept by Mr. Hamel, of his Exploring Survey of the District of Gaspé, in 1833:—

Cascapédiac, corrompu de Sâkpédeak, forts courants.

Caribou, Caribou, (this Canadian word is therefore of Micmac origin.)

Gaspé, altered from Kespèque, bout de la pointe de terre.

Matapédiac, volume d'eau qui descend d'une grande marre.

Paspebiac, Pipsiquiak, Batture fendue.

Portage, Portage, (a French word adopted by them; they must have originally had one of their own. Is it forgotten? this is a curious circumstance.)

Québec, Rivière qui paroit fermée.

I do not see any thing in the Etymology just given of "Quebec" to alter the conclusion previously stated on this head.

The terminating syllable of "Quebec," it must be admitted, is not at variance with the phonetic analogies of the Micmac tongue, indeed, is in entire accordance with it, even with the very name of the tribe.

But the modern name of Quebec must have been given by its Indian inhabitants,—and the Micmacs were never, so far as we know, in possession of this part of the country.

That the Micmacs should have confounded the French name "Quebec" with the Huron name already given, and transferred the signification of the latter to the former would not be surprising.

ART. XV.—A GEOLOGICAL SKETCH OF THE MOST SOUTH-EASTERN PORTION OF LOWER CANADA.—BY LIEUT. F. H. BADDELEY, R. E., MEMBER OF THE GEOLOGICAL SOCIETY OF FRANCE, &c. &c.

The following Geological outline refers to the most south-eastern portion of Lower Canada, and to a country bounded on one side by the gulf of St. Lawrence, on another by the Bay of Chaleur, and on a third by the Metapediac river and lake, with the over-land route to Grand Metis, the whole forming a peninsula, whose greatest length, measured from Grand Metis to Cape Gaspé, is about one hundred and sixty miles, and greatest breadth, from the Magdalen river to Carleton, is about eighty.

Descending through the gulf of St. Lawrence from Metis to Cape Gaspé, the first feature in this country which attracts the attention is a range of mountains running nearly parallel with the shore, at a distance from it of perhaps from ten to twenty miles. The most elevated point of this range has been determined by Captain Bayfield to be three thousand seven hundred feet above the sea, a height which is nearly double that of any land in Canada, whose elevation has been ascertained.

Passing Cape Gaspé into the Bay of Chaleur, when off Percé, the end of another range from the south-westward is noticed, it is, however, considerably less elevated, never, I should think, exceeding one thousand five hundred feet.—Between these two ranges, far back in the interior, a table land exists, as there is reason to believe, destined, like other cultivable wildernesses, ultimately to receive settlers.

There is perceived a great contrast between the shores of this country on the side of the Gulf and those in the Bay of Chaleur, the rugged cliffs on the former pursue a nearly straight course to the north-eastward, (which ultimately becomes east) and suffer little or no other interruption in their continuosity, then what arises from the occasional occurrence of a small river or cove, offering little shelter to vessels seeking harbour.—The shores of the Bay of Chaleur on the contrary, though often rugged also, are deeply indented by bays affording frequently good roadsteads and sometimes harbours; indeed nearly the whole of this fine arm of the sea, which should be rather called a gulf than a bay, may be considered a good roadstead, while the basin of Gaspé, situated at its entrance, offers to mariners one of the finest, most secure and commodious harbours in the world, and it demands no prophetic foresight to see that one of these days this place must become the site of a great commercial port.

Referring my brother Members for further topographical details to my report on this country, in the hands of the Commissioners for exploring the unknown parts of Lower Canada, I will proceed to give a rapid digest of its geological features, the details of which will be also found in the same report.* Commencing at Grand Metis we

* In the instructions from the Commissioners, under whom I acted, when the materials for this communication were obtained, geological and mineralogical enquiries occupied only a secondary place, the capabilities of the country, in an agricultural point of view, being in them the paramount object.—Now it is well known, that although soils often depend upon the nature of the rocks they are associated with, they reciprocate little assistance towards the determination of the geological names, &c. of those masses themselves, which they often deeply cover up and conceal from the eye of the geologist, who, while pursuing his interesting speculations would, if he had the choice, greatly prefer to make the barren unproductive rock the subject of theme; it follows that the individual in the

find the well known transition clay slate, which so largely abounds in the vicinity of Quebec, and which, with its alternating calcareous and siliceous strata, exclusively possess the south shore from the Chaudiere to Cape Rozier, near which place, Captain Bayfield has detected the carboniferous limestone succeeding in *parallel* order to the clay slate. If there be no mistake either in naming this limestone the carboniferous or in describing it as conformable to the clay slate, which I have no reason to think there is, the fact is deserving of attention, in as much, as the position of this limestone contrasts with that which geologically is esteemed to be the same at Beauport, in this neighbourhood, where the strata are nearly horizontally disposed, and not dipping highly to the S. E. as at Quebec, Metis, Griffin's Cove and Cape Rozier. It is a fact, as Captain Bayfield justly observes, which seems to imply that

pursuit of good locations for settlers, is far from being in the best position to make geological observations on the country he traverses, which reflection, leads me to remark, how much that is interesting, both to science and to the public, might be elicited, if an individual qualified for the task, were yearly employed by the Home or Provincial Government, to collect geological and mineralogical information upon the Canadas, and, I know of no portion of the Lower Province which promises more favorable results than the district of Gaspé, without it be that important section southward of the St. Lawrence, and included between the St. Francis and Chaudiere rivers, wherein His Excellency Lord Aylmer recently originated the discovery of some valuable water communications. Among the useful rocks and minerals which have been ascertained to occur in this latter section, may be enumerated mica, talcose and roofings, slates, steatite, serpentine, asbestus, *gold*, lead and bog ores.—The gold is a recent discovery, a lump of it weighing 2½ ozs., with a specific gravity of 15.7, having been found last autumn in a stream running into the Chaudiere; it is said, however, that a similar fragment was picked up many years ago near the same place,—This fact, whether solitary or not, derives importance from the consideration, that much of the gold of the United States and of Russia is associated with rocks precisely analogous to those which are known to characterize the country in which this specimen was found.

the carboniferous limestone of Beauport, (and probably the whole of that which is horizontal in the country) is of more modern origin then that at Cape Rozier, otherwise like it, the Beauport strata would have been lifted an edge, conformably to the clay slate, by the same cause to which the latter owes its elevation. With the clay slate at Metis is associated a siliceous limestone and a conglomerate of the two.

The route from Metis to Lake Metapediac being south-easterly, carries you over the bassatting edges of the rocks. In crossing this interval black basaltic looking masses were seen in addition to the recurrence of those which have been mentioned. The shore at the head of Lake Metapediac is covered with an angular shingle of clay slate, indicating the great proximity of the rock itself. This formation seems to extend quite to the Ristigouche, within a few miles of which, clay slate was again particularly observed forming rapids or slight falls in the river; our rapid progress down this stream prevented us from often closely examining the rocks we met with, but greenstone, quartz,* clay slate and perhaps transition limestone predominate. The rounded fragments of milk white quartz, in the bed of the river, strike the eye in passing them, by the dancing appearance they have, an appearance owing evidently to refraction, which one moment throws them, as it were, to the surface, and the next buries them in the water, according to the angle with the surface of the river at which they are viewed. The velocity of the waters in this river occassions almost all the alluviums which are forming in it to be composed of

* The quartz forms thick veins in the clay slate, and I think alternates with it also.

coarse materials, contrasting greatly with such as are forming in the sluggish waters of the Ristigouche, in which the alluvial deposits taking place, and they are many, are all composed of fine materials, covered usually, when above water, by a rich vegetation.—In some of the sandstones near the mouth of the Ristigouche, and which were there met with for the first time, a passage may be noticed between the most recent friable sandstone above, and the perfectly indurated rock beneath, affording in the estimation of some, a representation of a rock in the progress of formation, while others might explain this appearance by the action of weathering.

All the rocks we met with on the shore from hence to Cape Gaspé were secondary, the oldest of which occupying the lowest position, not only geologically but also geographically, as regards the Bay of Chaleur, is the carboniferous and fossiliferous* limestone of Cape Gaspé and Grande Grêve, associated in the neighbourhood of those places with sandstones, bituminous shales, coal, bituminous and sulphuretted springs. As we ascend the bay the new red sandstone formation succeeds, (un-conformably ?) accompanied, as in Europe, by its characteristic series of trap-rocks and coarse conglomerates. Individuals little experienced in geological phenomena might not readily see much analogy between these trap-rocks and modern lavas; the case would be very different, however, were he to examine fragments of rock met with far back in the interior, particularly some from

* I have rarely noticed fossils in the decided transition rocks of Lower Canada, but in those which succeed to them, they abound. Among those recognized in the limestone of Gaspé are madrepores and orthoceratites, and some of the sandstones are crowded with tevebratulæ.

the bed and shores of the Caskapediac, about fifty miles upwards from its mouth, where they occur in great profusion. These fragments* he would find it difficult to distinguish, as hand specimens, from some recent lavas, and they are found in the vicinity of insulated dome shaped mountains, from whence they probably have originated.

Opposite to the mission or chief domicile of the Indians located in this bay, there is a remarkable dome shaped mountain, whose height was determined by trigonometrical

* They are porphyries and vesicular or amigdaloidal wackes, but, whether transition or secondary, I have no data to determine. The paste of these porphyries and wackes is usually of a dark cinder grey or bluish grey colour, occasionally it is greenish. Their structure is partly porous, partly porphyritic, and partly amigdaloidal, the porphyritic structure, which is usually observed in fragments, distinct from those in which the other two varieties of structure occur, is occasioned by imbedded crystals of white lameller fel-spar, not easily seperated from their paste. The porous and amigdaloidal structures usually occur in the same fragment, and have a natural tendency to pass one into the other.—The latter is occassioned by ovular or rounder concretions, consisting of chlorite, stilbite and calc-spar, which, unlike the fel-spar. are easily detached. Two of these usually occur together, forming one concretion, the chlorite enveloping the stilbite or calc-spar in a greenish or brownish crust, shaped like a small pea or almond, having a fibrous structure and silky lustre, while the structure of the enclosed stilbite is lameller lustre, pearly and colour white,—the latter fuses with almost the facility of borax and in much the same manner, into a blebby, nearly opaque, white glass or enamel, but the mineral acids appear to produce no effect upon it.—The effect of the blowpipe on the paste itself is to convert it, with difficulty, into a dull black globule. The curvilinear concretionary forms, which are, in general, centrically hollow, appear originally to have filled all the cells of the porous wackes, as most of the latter shew some traces of the former, but that their presence has been the original cause of this structure, is an opinion which is opposed, it would seem, to the fusible character of some of these concretionary minerals, assuming, as almost all geologists do in the present day, that these rocks are of volcanic origin. We are not to forget, however, that they may have been, and probably were, formed under a great oceanic pressure, which would have had a tendency to raise the point of fusion of all minerals imbedded in them.—In general, however, the deposition of these minerals is attributed to a period subsequent to the formation of the rock they are disseminated in and in part to a condensation of gas while cooling.

calculation to be one thousand two hundred and thirty feet. This mountain has been considered to be of granite, it is, however, a trap,* with a structure obscurely porphyritic, and here I will observe, that the occurrence of granite *in situ*, throughout any portion of this peninsula, is conceived to be improbable. The obvious place to seek it would be in the range of mountains before described, as running parallel to the south shore of the gulf of St. Lawrence, but which range I should suppose was either trapose or of clay slate, and my chief reason for this opinion is, that while, with two unimportant exceptions, a specimen of granite or other pirmary rock, either rolled or fixed, was not met with in the whole of the country traversed, trap and clay slate fragments were found to abound.

Judging from the very limited *data* I have been able to collect, I should say, at a venture, that the line of division between the transition and secondary strata would be found roughly between Cape Rozier and the mouth of the Restigouche, which line has about the same bearing as the edges of the transition strata, that is, N. E., S. W.

Those members of the new red sandstone, with which most of the rocks in the bay agree, particularly those situated westward of Point Peter, are apparently the Exeter

* I cannot state the kind of trap, but instead of doing so, I offer to the accomplished geologist the following mineralogical description, from which, it is presumed, he will recognize it :—

Aspect nearly homogeneous-colour, reddish brown,—structure rather compact than lamellar,—lustre none, or only glimmering,—hardness moderate, yielding readily to the knife a whitish grey streak, but scratches window glass ;—fracture scaly uneven,—specific gravity 2 .6,—infusible before the blowpipe. The rock has externally a thin ferruginous coating, and its glimmering lustre, when it exists, appears to be owing to the reflection of light from minute crystals of glassy fel-spar. Its infusibility perplexes me—is it a porphyry, the base of which is siliceous ?

Red Conglomerate of Dela Beche, and its trapose associates, which form in Europe the lowest rocks of this formation, and they are here as there, characterized by their usual red colour and coarse conglomerated structure.

The foregoing geological description will naturally induce the enquiry from those conversant with the subject, whether any, and what indications of coal exist in this section of the Province, particularly if it be called to mind that it borders on the coal bearing basin of New Brunswick, a portion of the northern edge of which, it may indeed be esteemed to be. I may answer, generally, that several indications are met with on the shores of the bay and in the interior, they are not all, however, equally promising, the most so, I think, are those met with ascending the Gaspé River, up which the petroleum and sulphuretted springs, sandstones and bituminous shales before mentioned, are found, the sandstone sometimes interleaved by bituminous coal,—nor should I be in the least surprised if here, or in some other portion of the geological interval, between the carboniferous limestones and Exeter Red Conglomerates of the country, bituminous coal in some abundance should be discovered, as it already has been in small quantities, for it would there occupy a geological position, out of which, experience tells us, it rarely wanders; the coal also which has been noticed up the Mal Baie and Port Daniel rivers, although we possess no details respecting its occurrence in those places, are favoring symptoms, as are likewise the indications observable on the New Brunswick side of the bay, and which are still more pronounced.

Among the minerals met with in the Bay of Chaleur, besides coal and petroleum, may be reckoned galena* and

* Galena has been noticed at Grand Grève, Little Gaspé, and Indian Cove, on the other side of the bay.

blende,* forming small veins in the carboniferous limestone near the mouth of the bay, and also disseminated in the rock. Jaspers, carnelians, chalcedonies and agates, one passing into the other, and either forming veins† and concretions in the trap rocks, or strewing the shores as pebbles‡ under a rounded detached form. Lithomarge and basalt, the former in concretions, the latter in dykes, associated with seams of coal on the New Brunswick side of the bay, and it has been said gypsum, a mineral, however, which I did not see, although its occurrence is not doubted, as it is characterestic in Europe of the upper members of the new red sandstone formation, which formation I conceive to be the predominating one, on and in the neighbourhood of the shores of this bay.

The best sections which present themselves in the bay for examining the conglomerates of this formation, are perhaps those to be met with in the neighbourhood of Percé. It has been said before that here terminates that mountainous chain from the westward, which characterises its northern shore. A high mountain, called the Table Roulante, probably the highest in the chain, and immediately at the back of Percé, represents this termination, an off-spur, from which cuts off all easy communication by land, between Percé and Mal Baie, the southern shore of which it forms.—In the prolongation of this spur of land to

* Blende, both yellow and black, is associated with the galena at Grand Greve.

† These veins are very conspicuous in the trap islet or peninsula opposite the settlement of Dalhousie, where is noticed chalcedony and agate lying sandwich fashion between two layers of jasper in a nearly vertical position, and bearing N. and S.

‡ These pebbles have long been noted for their beautiful oriental markings and shades.

the eastward is observed the perforated rocky islet, which gives the name of Percé to the locality, and the island of Bonaventure, both evidentiy outliers to the conglomerated masses, which form precepitous sections on the shores of the main land, with which they have a close geological agreement. I was prevented by rough weather from visiting the islet, but on the south shore of Mal Baie and Bonaventure island, I have the following observations to offer:—Both places are characterised by precipitous cliffs, whose strata, unconformable to the transition rocks we have described, and also, I think, to the carboniferous limestone of Cape Gaspé, in many places overhang, in their upper portions, the waters of the bay, and threaten distruction to the adventurous individual who breasts their sides. These conglomerates are composed of aluminous, siliceous and calcareous pebbles of a rounded form, varying in size and also in colour, the predominating shades of which are reds, purples and greens. Among them I recognized jasper, lithomarge, wacke (trap) and a sealing wax red zeolitic mineral, disseminated in grains through the mass of many of these conglomerates, the paste or cement of which appears to be in general calcareous. The associated limestones are either semi-crystaline, earthy or compact, the first mentioned have sometimes a zoned structure, like portions of the rock of Gibraltar. In the earthy and compact varieties I noticed bivalvular impressions, having a strong pearly nacre, but from want of practise in this department of the science, I am not able to determine their genus, they seem to abound (judging from specimens in our cabinet) in a yellowish or reddish compact limestone, which is met with in the perforated islet before mentioned. The arches or perforations in this rock have been formed evidently by the

same cause which has effected the disjunction of these outliers from one another and from the main land, and that cause is as obviously a watery erosion. Small nuclei of an anthracitic or blind coal were noticed in the overhanging cliffs in the south side of Mal Baie, and I was informed that the bituminous variety it also found, but this I did not see. The occurrence of bituminous coal on the New Brunswick side of the bay is also inferred from the reports of others, rather than my own observations, for the indications noticed by myself at Point Ainempk, on the Ristigouche, consisted in the presence of a bituminous shale, that burns with great difficulty, emitting little or no flame, aud leaves a large stony residuum. I am far from asserting, however, that the true bituminous coal has not been met with on this shore, on the contrary I feel assured that it has, and have little doubt that when sought for it will be found, almost as abundantly in the northern portion of New Brunswick as it has been in the southern.

Abstract of the Meteorological Journal kept on Lake Superior in 1824, by the surveying party under the command of Lieut. (now Captain) Bayfield, R. N.

	Temperature.							Winds.						
	Mean			Highest.		Lowest.								
	10 A.M. and 10 P.M.	At 7 A.M.	At 2 P.M.	At 7 AM.	At 2 PM.	At 7 PM.	At 2 PM.	Westerly.	Easterly.	Various.	Days on which Snow fell.	Days on which Rain fell.	Dry Days.	Thunder storms.
January	8°,20	5°,2	17°,6	32	41	-37	-20	14	4	13	6	,,	25	,,
February	0, 80	-7, 6	11, 5	20	28	-37	-22	16	6	7	5	,,	24	,,
March	19, 92	17, 5	29, 5	35	34	-12	2	11	16	4	8	3	20	,,
April	33, 38	30, 0	41, 0	36	51	12	32	6	18	6	4	2	24	,,
May	41, 45	38, 4	50, 9	60	72	24	31	9	14	8	1	6	24	,,
June	50, 00	46, 8	54, 8	60	68	36	40	15	8	7	,,	6	24	1
July	63, 55	59, 4	68, 8	64	82	50	56	18	8	5	,,	9	22	3
August	60, 90	57, 8	70, 1	68	80	45	58	16	10	5	,,	8	23	8
September	53, 30	52, 0	60, 9	67	77	38	50	14	11	5	,,	9	21	1
October	34, 15	29, 7	42, 2	48	60	18	27	16	9	6	4	5	22	,,
November	22, 82	18, 5	28, 4	38	41	-2	15	12	10	8	8	4	18	,,
December	13, 80	9, 6	22. 0	38	41	-24	0	19	5	7	6	1	24	,,
Annual	33°,46	29°,8	41°,48	68	82	-37	-22	166	119	81	42	53	271	13

From the 25th of May to the 7th of September on various parts of Lake Superior, the remainder of the time at Fort William. Lat. 48° 23′ N., Long. 89° 23′ W.

Abstract of the Meteorological Register kept at Cape Diamond, Quebec, from January 1832 *to December* 1834.

1832.	Temperature.			Winds.			Days with snow.	Days with rain.	Dry days.	Thunder storms, &c.	Aurora Borealis.
	Mean at 9 A.M.	Highest.	Lowest.	Westerly.	Easterly.	Various.					
January	9°,92	39°	-17°	18	6	7	10	2	20	,,	2
February	7, 90	34	-25	19	7	3	13	,,	16	,,	2
March	19, 87	60	-11	20	8	3	8	4	19	,,	2
April	30, 13	52	3	15	13	2	9	4	19	,,	4
May	45, 39	74	28	7	23	1	2	11	18	,,	4
June	57, 50	82	41	15	13	2	,,	13	17	3	1
July	62, 06	85	44	14	17	,,	,,	20	11	5	1
August	65, 13	83	40	25	4	2	,,	10	21	7	2
September	53, 17	74	36	23	6	1	,,	14	16	2	2
October	42, 26	63	24	22	8	1	2	13	16	,,	2
November	26, 07	48	3	22	6	2	11	4	15	,,	1
December	11, 03	32	-12	20	10	1	8	1	22	,,	,,
Annual...	35°,87	85°	-25	220	121	25	63	96	210	17	23

1833.	Temperature.			Winds.			Days on which snow fell.	Days on which rain fell.	Dry days.	Thunder storms, &c.	Aurora Borealis.
	Mean at 9 A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.					
January	9°,00	36°	–30	21	8	2	11	2	18	,,	,,
February	5, 68	40	–16	17	6	5	9	1	18	,,	,,
March	17, 60	48	–20	18	9	4	6	1	24	,,	3
April	37, 70	80	9	11	14	5	5	8	17	,,	1
May	51, 22	75	26	11	17	3	,,	15	16	2	4
June	55, 47	84	30	15	7	8	1	13	16	2	2
July	62, 32	80	45	24	6	1	,,	17	14	6	3
August	59, 30	82	40	18	8	5	,,	17	14	2	5
September	50, 93	66	32	19	7	4	,,	11	19	1	5
October	38, 65	57	19	19	7	5	1	15	15	1	1
November	25, 10	48	0	20	7	3	8	2	20	,,	2
December	17, 20	36	–2	12	15	4	8	,,	23	,,	2
Annual...	35°,85	84°	–30	205	111	49	49	102	214	14	28

1834.	Temperature.			Winds.			Days on which snow fell.	Days on which rain fell.	Dry Days.	Thunder storms, &c.	Aurora Borealis.
	Mean at 9 A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.					
January	3°,00	29°	–23°	22	7	2	14	1	17	,,	4
February	17,28	41	–15	14	13	1	6	4	19	1	2
March	21, 00	43	–7	18	8	5	7	3	21	1	4
April	36, 56	69	11	15	10	5	2	8	20	,,	6
May	46, 38	69	24	12	13	6	1	14	17	,,	5
June	57, 46	77	41	15	13	2	,,	11	19	3	3
July	67, 06	93	50	20	7	4	,,	10	21	6	2
August	60, 06	82	45	17	13	1	,,	13	18	2	2
September	55, 06	78	29	23	6	1	1	9	20	3	3
October	37, 67	65	20	17	8	6	6	11	14	1	3
November	25, 13	40	2	22	8	,,	11	2	17	,,	5
December	5, 10	28	–24	16	14	1	17	,,	14	,,	2
Annual...	35°,98	93°	–24	211	120	34	65	86	217	17	41

NOTES ON THE

ANCIENT ENGLISH,

OR

ANGLO-SAXON LANGUAGE.

AN antiquarian research into the primitive dialect of our English ancestors will tend to correct many errors, still prevalent even amongst men of intelligence ; and the result will be by no means flattering to the pride of the modern scholar. Accustomed, if fond of classical associations, to recognise with pleasure any word derived from his favorite models, the Greek and Latin, he will gradually come to the forced conviction, that what he has been used to consider the ornament of his vernacular tongue, namely, the frequent use of words borrowed from the dead languages, might well have been dispensed with—the primitive language of our ancestors, before the Conquest, neither in general requiring such assistance, or greatly benefitting by it when introduced. In fact, the adoption of these words into the English language was rather the effect of accident,—the Norman invasion having brought in the use of French terms derived from the Latin, a Celtic tongue—than of any poverty in the Saxon idiom. As a proof of this, let it be considered how small a portion of the Anglo-Saxon is even now obsolete in educated society. And in the country parishes of England, an idiom not far removed from the Saxon is to this day very generally spoken. What we, in our learned superciliousness and abhorrence of the vulgar, denominate the *dialects*, and the jargon of Somersetshire, Lancashire, and Yorkshire, will be found, on examination to be pure remains of original English. A familiar example may be given : it is known that those words in Saxon which denote *authority* also denote *age*. Thus in Saxon, for the "Prince of them", we have "yldest on them", which is in fact, in vulgar English, the "*eldest on 'em*."

Correct writing in English is considered the peculiar ornament of a scholar. Yet it is to be feared, that there are too many, from habit and imitation accustomed to write what they term good English, who are equally unable to comprehend the primitive meaning of words derived from the dead languages, which they affect to use with such fluency—and to do justice to the real merit and character of the despised Saxon, in defence of which, as an antiquarian, every philologist will lift up his voice.

An inquiry into the origin and structure of language in general is a research of the highest antiquarian order, next to the study of geology, or the world's formation. All who would successfully enquire into the structure of the English language must refer themselves to its Anglo-Saxon ancestor. It has been ascertained by the learned, that not more than one fifth of the English of Alfred's time is now actually obsolete. How reprehensible then is the neglect of this study, and how needless the extravagant admiration of the classical terms, which are now incorporated in the language we daily use. The loss of the fifth part of the great Alfred's language has been compensated by a supply of French and Latin derivatives, which came to us from the admixture after the Norman conquest. It may well be doubted, whether to any other than a classical taste, or for any other purpose than to supply the want of adequate technical phrases, generally Greek,—which our ancestors, themselves deficient in the Arts, could not by any possibility have possessed—this loss has been triumphantly remedied. It is, we think, undeniable, that richly copious as the two principal dead languages are, they are equalled, if not in some instances surpassed, by the Anglo-Saxon. For example, for *man*, we have in Latin the nouns, VIR, HOMO, MAS: in Saxon there are no less than *ten* distinct and appropriate terms, amongst which the Latin VIR may be discovered in two different forms. Again, for the intellectual part of man, the Latin gives us MENS, ANIMUS, RATIO: the Saxon supplies us superabundantly with no less than *eighteen* forms, equally expressive of the various powers of which the mind is capable. The principal of these are *Mod*, Anglicè "Mood", used by Shakespeare to signify "temper, passion,"—*Gemynd*, Anglicè, without the prefix, "mind"—*Gethoht*, in the same way, the English "thought"—but the most expressive yet simple definition to be found in any language for the mind is, perhaps, the Saxon term, *Ge-wit-loc*, or depository of the wit, the "wit lock." For the ocean, the Saxons had *fourteen* distinct terms; and owing as they did their success and glory to their skill in navigation (a character which did not degenerate with their

successors) they used no less than *twenty-eight* forms of speech to express a ship! If, in short, an unlimited variety of apt expressions, to denote the same or a similar idea—an abundance of phrases and metaphors, some of the deepest poetical impress, render a language copious and polished, such was old English before the partial introduction of the Norman French. Resolving itself, it its decomposition, into the most simple elements, while by its multiplying and compound qualities it rises to the character of a highly civilized language, the Saxon fully merits the eulogium of the learned writer, who maintained that books of History, Belles Lettres, and Poetry, might even now be composed in it with considerable elegance and force of expression.

All who understand the mechanism of language in general, are aware that the numerous parts of speech, multiplied for obvious grammatical purposes, have their origin, or rather may easily be resolved in to *two*, namely, the Verb and the Noun. In Greek the verb generally is the primitive, in Saxon, it is almost clear that the parts of speech are all derived from the noun. In the infancy of language, the *name*, or single idea, was soon extended, and made subservient to various uses and combinations as necessity occurred. The *noun* was soon employed in an active and passive sense, varying somewhat the original termination, and thus assumed the character of a verb. These *two* are indeed the only primitive parts of speech, all the others being composed from them. It is right, perhaps, to except the interjection, which is but a simple sound elicited by momentary feeling, and varying as pain or pleasure predominates in the mind or body. In modern English we have nouns, originally substantives, or expressing definite ideas, made adjectives, by adding them to other substantives, as, "Cold, Evil": we now say a "Cold day" an "Evil doer." And we have also in use nouns made verbs by a simple prefix, as "To love—to hate—to fear—to hope—to dream—to sleep" &c. all of Saxon origin.

Saxon adjectives were chiefly nouns with a termination, which termination has evidently been a word of meaning. The nouns so employed may be considered the most ancient. The four principal terminations which, added to nouns, make them adjectives, and which are all words of meaning, are still in general use. They are *like*, *full*, *less* and *some*. The two first require no explanation: *less* or *leas* is the Imperative Mood of the Saxon verb *lesan*, to dismiss—while *some* or *sum* expressed in Saxon as it does in modern English, a degree, or portion of a thing.

EXAMPLES.

Cild-lic.....Child-like, young.
Circ-lic.....Church-like, or Ecclesiastic.
Craeft-lic.....Craft-like, or Workmanlike.
Freond-lic.....Friend-like, now Friendly.
God-lic.....God-like, divine.
Faen-lic.....Fen-like, or Muddy.
Deorck-full.....Dark-full, or Dangerous.
Facen-full.....Deceitful.
Fear-full.....The same.
Caer-leas.....Careless.
Craeft-leas.....Craft-less, or Ignorant.
Feodh-leas.....Fee-less, or Money-less.
Winsum.....Winsome, gay.
Frem-sum.....Benign, kind.

Of other terminations of nouns made adjectives, one is still familiar. It is *ig*, pronounced *y*, as at present: thus,

Blod	*Blod-ig*	Blood, bloody.
Clif	*Clif-ig*	Rock, rocky.
Craeft	*Craftig*	Craft, crafty

and many others.

The comparison of Saxon Adjectives is made by adding *er* to the positive, and *est* for the Superlative, as in modern English. It is believed that *er*, in the oldest languages, which are of oriental origin, signifies *priority* of any kind. It also signifies *a Man*. Hence, probably, the Greek ἀνηρ, a Man, αηρ, the air—the Latin *ver*, spring, and *vir*, a man. In old Saxon we find *wer* a man and *fira*, a man: in old Irish, a Celtic language, we have also *fir*, a man. These latter may be obtained from the Oriental primitive *er*, pronounced with a breathing similar to the Greek Digamma, *w*, *v*, or *f*, familiar to classical scholars. The superlative termination *est* implies in Saxon, "abundance, munificence." It signifies also the *east*, the sun being the giver of light and heat, the author of abundance, and being considered to rise in that quarter of the heavens.

Verbs have been well said to be to the student in Philology what the secondary formations of the earth are to the Geologist. In Anglo-Saxon, they were generally formed from nouns, by adding the termination *gan*, *ian* or *an*. The former, *gan*, to go, was the verb of action or motion, and is still preserved in the Cumberland and Lowland Scottish dialects, *gang*. *Jan*, or *an*, is the verb of giving, *to give ;* but these may very fairly be considered abbreviations, or rather variations of the verb *gan*, to go. In the Mœso-Gothic, a language much older than its descendant, the Saxon, we find this termination in the verb *bid-gan*, to pray, or *to go* to pray. In the Saxon, by abbreviation, we find *biddan*. to pray. This primitive, *bidde*, is still found in modern English, in nearly the same sense.

In the examples which follow, those verbs are selected which in different shapes, are still extant:

EXAMPLES.

Baer	a Bier	*Baeran*, to carry, to bear.
Baeth	a Bath	*Baeth-ian*, to bathe.
Bat	a Club	*Beat-an*, to beat.
Bidde	a Prayer	*Biddan*, to pray.
Bliss	Joy	*Bliss-ian*, to rejoice.
Blostm	a Flower	*Blostm-ian*, to blossom.
Blot	a Sacrifice	*Blot-an*, to sacrifice.
Bridl	a Bridle	*Bridl-ian*, to bridle.
By	a Habitation	*By-an*, to inhabit.
Byseg	Business	*Bysg-ian*, to be busy.
Cnyt	a Knot	*Cny-ttan*, to knit.
Curs	a Curse	*Curs-ian*, to curse.
Cos	a Kiss	*Cyssan*, to kiss.
Dael	a Part	*Daelan*, to deal, to divide.
Daeg	a Day	*Daeg-ian*, to shine.

The above is only a specimen of the older formation of Saxon verbs. Those verbs, before which we find the several prefixes, *a—be—ge—for—on—in—to—with* and *y*, are secondary verbs, many of them now in daily use.

The Saxon participle terminated in the syllable *gend*, not unlike the Latin *ens*. It is needless to remark, that in modern English, it has become *ing*.

It has already been said that those nouns were of the earliest formation, which are found employed in forming adjectives, and verbs, by adding specific terminations. In the progress of time we may suppose that these nouns so made verbs and adjectives,

fell into disuse, or rather became scarce in their former quality. The advanced state of the Saxon language in the time of Alfred, may, therefore, be better estimated by the nature of the process adopted to create a new series of substantives, to supply the deficiency, or answer the increasing demand. It was most ingeniously effected by adding a second or new termination to the adjectives, which had themselves been previously made from nouns by adding the termination, as has been shown. Some of these additional substantives have come down to the present time, and are among the words in more common use. Let us take for instance the Saxon termination *nysse*. From the substantive, *Cear*, care, the same as the Greek κεαρ, *heart*, *cœur*, French, we get first the adjective, *Cear-full*, careful, and then the new substantive, *Cear-full-nysse*, carefulness. In the same way we have *Caer—Cear-leas—Cear-leas—nysse*. And so of many others, of which the modern remains may be found in English nouns ending in *ness*.

Other secondary nouns were formed from verbs by adding the termination *ung*, in modern English, *ing* ; as from *leornian*, to learn, we make *leornung*, now "learning." It may be thought however, from this last termination, that these nouns rather inclined to the character of original participles, afterwards made to act as substantives. A further supply of secondary nouns was made by compounding two nouns in one, a practice now in daily use, as from *Ceap*, "cattle, property," came *Ceap-man*, a "chapman or dealer." All the compounds of the word *ship* come under this description, and of many other words.

From the above short notice of the structure of the old English, or Anglo-Saxon, language, it will be seen that before the admixture of French, Latin and Greek terms, the idiom was copious, and the resource abundant in itself. Our ancestors seem most readily and simply to have made their adjectives and verbs from their nouns—then again secondary substantives from them, by adding new terminations. Pursuing the subject further, the Philological student will find these nouns and verbs once more subdivided and abbreviated into the supplementary parts of speech, called Conjunctions, Prepositions and Adverbs.

The Article, as in Greek and Latin, was a pronoun—and the conjunction *that* was the neuter gender of another. Thus in Greek, οτι, in Latin *ut* or *quòd*, and in English and Saxon, *that*—familiar to all scholars.

Upon the whole, as no one can be a correct or finished English scholar without a close and discriminating examination of the various elements which are now combined in forming our rich

and powerful language, it may be hoped, that these desultory hints will not be entirely thrown away upon the youthful student in the interesting science of Philology. The words of the Poet should not be forgotten.

" Mortalia facta peribunt;
" Nedùm sermonum stet honos, et gratia vivax.
" Multa renascentur quæ jam cecidere, cadentque
" Quæ nunc sunt in honore, vocabula, si volet usus,
" Quem penès arbitrium est, et jus et norma loquendi."

ART. XVI.—ON SOME EXTRAORDINARY FORMS OF MIRAGE, BY WILLIAM KELLY, M. D.

READ 19TH MARCH, 1836.

When my attention was directed, some years since, to the different forms of objects, seen through mirage in the St. Lawrence, one of these, which I particularly remarked, was the flower-pot shape assumed by small islands, when affected by the mirage, which depends on the contact of warm moist air with a surface of water colder than its dew point. Whatever the real shape of the island, or rock might be, its top seemed raised and flattened ; generally extending in a straight horizontal line so far on each side, as at least to equal the base in extent ; often beyond it : whilst, midway between the base and distorted top, the figure was contracted, having the appearance of a neck, (Fig. 1). When two islands lay close together, these flattened tops sometimes met, giving the appearance of an arch from one to the other, (Fig. 2). In all other cases of mirage, depending on the same cause, the tops of objects seemed straight and horizontal in the same way, but the sides were like a wall. They frequently presented an appearance as if they were horizontally stratified.

In the paper on mirages published by the society in 1832, I hazarded a conjecture that these forms of arches, and flower-pots, might be owing to the beach of the islands being heated by the sun, and hence acting on the air, in contact with it, in a different manner from the surrounding cold sea. I have since found that the state of the air on the beach could have no share in producing the phenomenon ; as we observed it when the islands were so distant, that the beach was below the horizon, and the refraction consequently was wholly owing to the state of the air over the water nearer to us. The cause of rocks and islands assuming this form was afterwards made manifest to me, as I had an opportunity of seeing the mode in which it occurred at Mingan, in July 1832.

On the morning of the 16th July, at 9-30, the wind was light and variable, the sky clouded but bright, the temperature of the

Fig. 2

Fig. 1

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On the morning of the 16th July, at 9-30, the wind was light and variable, the sky clouded but bright, the temperature of the

air 59° the due point 51° the surface water 44°. One of the Perroquet islands, distant about 8 miles, seemed raised above the horizon, with a flattened top, and walled sides. At 10 A. M, the apparent height of the island above the water was diminished : the walled appearance of its sides, and flattened top were no longer perceptible; but on looking with a telescope it was found that the horizon itself was raised, causing the diminution in the relative height of the land. At 11-30 there was a light breeze from S. W : the sky clear, and the sun bright, the Perroquet then presented a well marked double image, the upper one being inverted. A fishing schooner, at anchor to the westward of the island, presented also a double image, the upper one inverted in the same way, but the whole less distinct than the images of the island. (Fig. 3). A line answering to the horizon, was also seen on a level with the upper flat part of the inverted image of the island, and extending from it to a sandy point on the main. The true horizon was quite distinct, and well marked beneath. The sandy beach between us and the point seemed raised like a wall. The two images of the island did not remain long distinct: the upper one gradually sunk, and when both met, the island had the flower-pot shape. There was a faint return of two distinct images, about a quarter of an hour after, but it lasted only a few minutes. On the 17th we had again an inverted image of the Perroquet, but not so distinct and well defined as the day before. It soon presented to the naked eye nothing more than the flat top and walled sides usually seen in this form of mirage. But on examining it carefully with a telescope, in some parts of the flattened top, the picture of a beach was seen above the trees ; thus shewing that this form also depended or a second inverted image lying above, and confounded with, the upright one.

Since that time I have frequently observed the flower-pot shape of islands during the mirage ; and by the help of a telescope, have found certain indications of the inverted image ; the upper line generally extending as a false horizon, on the inferior edge of which, the play of the waters could be occasionally noticed. The upper portion of the flower-pot figure resembles the lower exactly in shape, as far as it extends ; and the image of the stones of the beach, which is sometimes seen in it, leaves no doubt of its being an inverted picture.

All the various forms assumed by objects, under the influence of this mirage, seem to be the result of two or more images, alternately erect and inverted, either distinct or mingled together in a greater or lesser degree. When the objects are near,

the images are usually confused; they are so occasionally in distant objects, but can, in most instances, be distinguished by the help of a telescope; and sometimes they are beautifully distinct to the naked eye. The beginning of summer is the time when the contrast between the temperatures of the air and water is greatest. During the first four years of the survey, when we passed this time in the narrow parts of the river, we had no opportunity of observing more than a double image; but in June 1832, we went at once to the gulf; and in passing Point des Monts, where the breadth of the river is very considerable, we saw the three images distinctly marked, such as they have been described by Vince and Scoresby. The appearance they presented, and the attendant circumstances of both air and water, have been narrated by Captain Bayfield in a paper published in the Nautical Magazine for Feby. 1835. We have frequently since seen treble images in the destuary and gulf, but never so beautiful as on that occasion.

A telescope, if at hand, should always be employed in observing mirages of any kind, as it enables us to detect particulars, that would escape the naked eye. On one occasion, when to the naked eye, the hull of a ship seemed raised to an enormous height, and the sails very small, the telescope shewed three distinct images. Of the two lower the second was inverted, and its rigging and sails intimately mingled with those of the first upright one. The third image was erect, with its hull resting on the inverted hull of the second. (Fig. 4.) The space between the hulls of the first and second image being occupied by a confused mingling of masts, sails and rigging, gave to the whole the appearance of one immensely raised hull, as already stated.

By the help of the telescope we were afterwards enabled to detect five distinct images, though the whole gave to the naked eye the impression of only one almost shapeless mass, like that which I have just mentioned.

We were off Metis on the afternoon of the 14th of September 1835. There was a light easterly wind and cloudy sky: the temperature of the air 48°. the due point 40°. 5; the surface water 39°. 5. The barometer 29-90 falling. Some light rain fell two or three times during the afternoon, and we had very heavy continuous rain after night-fall. Several vessels were in sight between 3 and 4 P. M. and all presenting a variety of appearances from refraction. The most remarkable was that in which a vessel with all sail set, at one moment looked like an immense black chest, no sails or masts being visible. On observing her for a time the black body seemed to separate

horizontally into two parts ; and two sets of mingled sails occupied the intervening spaces, with one set of very small sails above. The figures afterwards became more distinct, and three images were clearly discerned. Another vessel changed also from the form of a great square flat-topped chest, to five distinct images, the upper with the sails erect, and the two lower double images with their sails rather confusedly intermingled. (Fig. 5.) A raised horizon was parallel to the upper figure of the hull. In a third case, the chest-like figure divided into two portions, of which one appeared much nearer than the other, the sea seeming to be interposed. This appearance occurred afterwards in other ships. When we first saw it we thought there really were two hulls, and the deception was only removed by the figures gradually uniting, and forming one.* Captain Bayfield and Mr. Bowen observed five distinct images of another vessel after I left the deck.† When I first noticed extraordinary appearances, like those I have endeavored to describe, I was not aware of the advantage of employing a telescope for the examination of objects at inconsiderable distances. As the whole appeared to be a single image, it seemed extraordinary that the hull of a ship should appear to have its altitude so immensely increased, whilst the masts and sails had their height lessened in an equal, or even greater, degree.‡ A general increase, or a diminution, in the altitude of any object might be reconciled to optical principles, but I could think of no mode that could, in any way, account for the contrary manner, in which the upper and lower parts of the same object seemed to be affected.

It seems probable that the horizontally stratified appearance, which the coast often assumes under this species of mirage, may

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*The alternate union and separation of the different images, which often occur within a few minutes, cause a very curious variety in the forms which objects seem to assume.

†Since this paper was read we had an opportunity of seeing the form of a ship changed by mirage in a way we had not previously met with. Off Basque Island on the 10th September 1836, at 3 P. M. two ships to the eastward seemed each to consist of three immense columns of irregularly formed sails, with a set of small distinct sails at the top of each column. The images seemed, not only immensely raised, but also extended horizontally (a circumstance which we had not remarked in any previous case) the space between the masts being considerable, and each column of sails quite distinct. The jibs were indistinctly erect and inverted alternately, giving some appearance of a combination of images, but there was no appearance of a hull. (Fig. 7.) The vessels were some miles distant from us, probably hull-down. The temperature of the air was 47° water 39°. The dew point, found shortly after when a breeze had spring up and the mirage disappeared, was 37°.

‡On one occasion, at Bic, what appeared to be a large high boat, with two men sitting on the thwarts, turned out to be a small schooner under sail.

be the effect of multiplied images of the horizon, or level sea at its base. The number of images may as well exceed five, as we find they do three, which, I believe, was the greatest number hitherto noticed by any observer.*

The temperature of the surface water varies much amongst the Mingan islands. Several rivers empty themselves into the sea at this place, the waters of which, in calms, float on its surface, which thus is sometimes several degrees warmer than the water at a depth of a few inches. A moderate current of air, which amongst small islands is often partial, sometimes, by agitating the water at one place, renders the surface there cold, whilst it continues warm in places sheltered from the wind. We have hence occasionally strange combinations of mirage. On the 16th and 17th July, shortly before the double images of the Perroquet were observed, the islands to the eastward of the harbour had their extremities apparently projecting in the air, as is usual in that species of mirage which depends on the temperature of the surface being higher than that of the air, or at least higher than its dew point. The horizon on this side was low and near—a rock, three miles distant, seemed above it. As the breeze sprung up from the s.w. the horizon receded beyond this rock, and the islands generally appeared to have flattened tops, shewing the mirage of the opposite kind. But the extreme points of the most distant island seemed still in the air, notwithstanding the island generally presented the same flat level top as the others—thus shewing, in its different parts, the opposite forms of mirage at the same time.

Something like this occurs frequently in the strait of Belle-isle, where we saw the Labrador coast exhibiting the flattened tops, walled sides, and other marks of the mirage which is connected with a cold surface, whilst on the Newfoundland side the horizon was depressed, and the points and low shores of the headlands seemed consequently lifted into the air. Whenever we had an opportunity of examining the temperature of the water, on both sides of the strait, we found it warmer near the Newfoundland shore, and the different forms of the mirage, which we saw at other times, seems a proof that it is generally so.†

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*Whatever the number of images may be, they appear in every instance, to be alternately erect, and inverted.

†The most remarkable mirages over water have occurred in straits: those seen by Mr. Vince at Dover, and the celebrated Fata Morgagna at Messina. In the St. Lawrence they are most frequently observed, and present the greatest varieties in similar situations: as at Bic, Point des Monts, Mingan, and the strait of Belle-isle.

In these cases there was no particular point, which could be fixed on as shewing, that there the effect of either mirage ceased. The raised horizon on the one side, and the depressed horizon on the other, seemed to merge one into the other; and the whole line across the strait appeared unbroken. But on one occasion near the Labrador coast, the point of junction of the two species of mirage was so well marked, that it appeared like a step in the horizon.

On the 18th of June 1834, we were approaching the coast of Labrador from the central parts of the gulf. At 8. 45 A. M. the temperature of the air was 46°; the dew point 45°; the surface water 43. 5; the sky clear; wind s. w, light; barometer 30. 12, rising. The dip of the horizon, from an elevation of 12 ft. 6 inches, was 3′. 15″, by the mean of three very good observations with the dip sector. As we neared the shore, the color of the water changed; the horizon, towards the land, seemed depressed; and the distant islands consequently elevated into the air. About the point where the water changed color, there seemed a sudden descent like a step in the horizon. (Fig. 6)

At 10. 30 we had got well within the dark discolored water; the air was 47° the dew point 46°; the water drawn from along side 46° 5: the wind and sky as before. The dip of the horizon, from the same elevation of 12 ft. 6 inches, was 4′ 11″, by the mean of four very distinct equal observations.

ART. XVII.—NOTES UPON THE COUNTRY IN THE VICINITY OF QUEBEC, BY HENRY D. SEWELL, ESQ. M. A.

READ BEFORE THE SOCIETY, SATURDAY 19TH DECEMBER, 1835.

The geological position of Quebec and its vicinity cannot fail of being an interesting object of investigation to the members of this Society. United for the purpose of carryiug our researches as well into the natural as into the political history of the country we inhabit; of looking forward to the future resources of a growing province, as well as, of tracing backward the causes of advancement or failure, which we have to admire or lament; an inquiry into the nature and structure of the soil beneath our feet, its external capabilities for the purposes of agriculture and its internal treasures as applicable to the arts and manufactures, must prove alike interesting and advantageous to each of us. It is not however my intention, on the present occasion, to enter, at any length, into so prolific a subject of enquiry; I shall content myself with throwing together a few scattered observations, which, meagre as they are, may, I trust, hereafter prove of some use to the geological historian of Canada. The field of observation is however wide and almost untrodden, and the facts as yet collected necessarily few; it must not therefore be made a subject of reproach or astonishment if, hereafter, as the country around us becomes more open to research, some of the observations which I am about to make should prove incorrect: where data are few and obscure, it cannot be expected that the conclusions drawn from them can be of a different type; all that is now pretended, is, to draw from the facts we have, such deductions as the nature of the case admits of.

The position of the City of Quebec is well known to all present: its Gibraltar-like character, its picturesque site, its capabilities as a port of trade, its great resources and advantages as the only natural outlet for the rich produce of the western Province, have all been frequently described. Our present business lies with none of these; the object now in view being, simply, an examination of the strata and substrata of this vici-

nity; the probable manner of their formation;—their position, nature and uses.

The promontory of Quebec, extending from the mouth of the St. Charles to the outlet of the river Carouge, a distance of nine miles, consists, mainly, of Clay-Slate (so called) black at Quebec—red at Carouge, whence the name Cap-rouge, and blue in the intermediate space; passing near the old French works beyond the St. Louis-gate, into a carboniferous rock—and alternating with a coarse-grained limestone conglomerate along the ridge extending from Palace-gate westward. At Sillery and thence to Carouge, a highly inclined stratum of Greywacke crops out, forming the north bank of the River St. Lawrence, hard, durable and easily quarried, and consequently held in high estimation as a building material. This formation appears to be of great extent—stretching along both sides of the river, and in many places extending far back into the country on the south side. It forms the bed of the Chaudière above and below the falls—sweeping round towards Pointe-Lévi, and probably passing there below the St. Lawrence as it appears again on the Island of Orleans in large masses, as well as forming the rocky islets in its neighbourhood. It again appears in large quantity on the north shore at Ange Gardien, alternating with sandstone—below which at St. Joachim it passes into a coarse conglomerate.

The mineral contents of these strata are, as follows: In the Clay Slate at Quebec—a species of petroleum which exudes from the rock, in dark thick drops, in the operation of mining, called by the workmen "*Gum*," and used by them as an application to flesh wounds;—seams of a shining, black, anthracitic coal;—quartz crystals, vulgarly called "Cape Diamond";—iron pyrites; cale spar; and indurated nodules of green jasper, capable of a high polish and sufficiently compact to bear the engraver's tool without chipping. The earthy oxide of Manganese and massive pearl spar are also found near Sillery.

At Carouge, associated with the Greywacke beds, are found pearl spar and carbonate of iron; rounded and hollow nodules of embedded Greywacke;—and occasional indications of coal in thin seams.

The only mineral spring yet discovered in either the Clay Slate or Greywacke is one highly impregnated with sulphuretted hydrogen, in the Clay Slate of St. John Suburbs, at one time a fashionable place of resort, but held in less repute of late years.

As a building stone, the Clay Slate is of very little use, being rendered friable by exposure to the action of the atmosphere and

splitting along the lines of its cleavage. Of late a very strong water cement has been produced from it by Captain Baddeley, R. E. which, it would appear from experiments that have been made both in this country and in England, is, in some respects, superior either to those of Hull, U. C. or Harwich, being more tenacious and not more subject to disintegration than either of them. This cement is also capable of being run into moulds, of which it takes a good impression and is consequently applicable to all the purposes of ornamental architecture. It is of a light buff colour, and rings with a metallic sound, when struck with a hard body.

The surface of the ridge we have been considering is in some parts thickly dotted with boulders—consisting of almost every variety of primitive rocks: of these I shall have occasion to speak more fully hereafter.

The natural productions are oak, ash, elm, pine (red and white,) spruce, balsam fir, or sapin and a vast variety of smaller shrubs, plants and grasses, the description of which come rather within the province of the botanist, than of the geologist. In addition to these the agriculturist produces wheat, barley, oats, Indian corn, buckwheat, and the usual root crops, in sufficient abundance. The soil is however gravelly and poor, requiring very frequent enriching.

Leaving the Clay Slate ridge we find ourselves to the north of the City, on an extensive alluvial plain or rather valley extending in breadth, from Quebec to the little village of Auvergne below Charlesbourg, a distance of about three miles, but varying in extent at different points—and in length from Quebec to Ancienne Lorette, a distance of about nine miles. The soil of this valley is very deep and consists generally of a surface of Clay loam lying upon a substratum of stiff clay, used in brickmaking, containing a large quantity of small spicula of talc of great depth and alternating with sand. In this substratum are found fragments of wood far below the surface. Last summer I discovered a very large tree apparently a Hemlock (abies canadensis) to judge from the appearance of the bark which still remains perfect, lying in a horizontal position full twenty feet below the surface. I have since discovered another at a still greater depth, and indeed the land shifts caused by the undermining of springs, and the disintegration of the stratum by the action of frost, are continually opening out these wrecks of former times. These have in all probability been deposited at a period when the waters of the St. Lawrence, by their expansion in this locality, have formed an extensive lake. The surface

of the valley is overspread with large boulders of granitic rocks, evidently deposited in their present situation subsequently to the formation of alluvial matter on which they repose.

The plain, throughout its whole extent, is rent by many deep ravines which act as outlets for the accumulated waters of the mountain range lying to the north of the City. These afford great facilities to the industrious farmer for draining the lands in their vicinity, and as they occur very frequently and the land itself lies on a gentle slope towards the south, it might naturally be supposed that advantage would have been taken of them for that purpose. But, notwithstanding the natural facilities thus offered, and the immense advantages derivable in an agricultural point of view from a careful system of drainage, large tracts in the immediate vicinity of the City, remain to this day overspread with stagnating waters, the abode of noxious reptiles, useless to their owners, and injurious, by their putrid exhalations, to the health and comfort of the inhabitants.

The whole plain abounds in a variety of botanical plants. The soil is rich, generally speaking, and well suited to the production of grain, hemp, flax and the esculent roots.

At the village of Auvergne we ascend a sloping bank of Clay Slate dipping to the south-east. This rock contains some few organic remains, but they are small and rare and generally imperfect. The most common is a very small trilobite—but from its minuteness and mutilated state, it is very difficult to identify the species. The upper part of the stratum is occasionally broken by jointed veins of indurated limestone, containing between the joints small portions of coal or jet—while in the lower part thick veins of a soft sectile sandstone, or rather Greywacke Slate, are found alternating with Clay Slate and containing organic remains similar to those above mentioned. The mineral contents are chert—whetstone—a rich umber and yellow ochre.

This bank may be traced from Cap Tourment thirty miles below Quebec to Three Rivers, about ninety miles above it, and I believe much higher, with every appearance of having at some distant period formed the northern bank of the St. Lawrence. It is in this bank at Beauport that the tertiary formation of marine shells is found, remarkable for the perfect state in which they still exist—the colours even in many instances remaining nearly as vivid as in the recent specimen. They lie imbedded in a close and heavy blue clay mixed with sand and overlying the Clay Slate. They are in large quantities, the stratum in many places for several feet in depth consisting of little else. These shells are found in several other places over-

lying the carboniferous limestone of which I shall have occasion to speak hereafter, but nowhere present themselves in such masses as in the locality just described. This formation seems to be the Pleiocene of Professor Lyell.

The Clay Slate formation of this vicinity is seen in great perfection in the gorge formed by the falls of Montmorency, and may be traced, at intervals, to a considerable distance west of Charlesbourg, until it dips under a loose bed consisting of rolled stones, sand and shells. In this formation has lately been discovered immediately above the Falls, a coarse rock—marle of a reddish grey colour, which has been applied as a mineral manure with eminent success to the lands in that neighbourhood—the produce from those fields to which it has been applied being at least equal, if not greater, than that of those enriched in the usual manner. The whole formation seems to be identical with that of the Clay Slate at Carouge, and is probably continuous below the alluvial deposit of the plain. In this latter a calcareous sand has also lately been discovered.

In deference to the opinion of those Geologists who have preceded me in the examination of our strata, I have called the rock we have been considering, Clay Slate—but I think there is more reason for considering it the Greywacke Slate of Jameson—and my reasons for this opinion are these, viz: 1st The Clay Slate of Jameson is a primitive rock. The Greywacke and the Slate of the same name a transition rock. Now it follows from hence, that if the rock in question be indeed the Clay Slate, we ought *always* to find it *inferior* in position to the Greywacke—but such is not the case; wherever I have found the two rocks in actual contact I have uniformly found the rock which has received the name of Clay Slate *superior* in position to the Greywacke. 2dly. The Clay Slate contains no organic remains, the Greywacke Slate does contain them,* and we have already seen that our rock contains them. 3dly. The Clay Slate is not very subject to contortions, the Greywacke Slate is more so, indeed "greatly subject" to them.† Of the contortions of our rock, very numerous instances present themselves near the Inclined Plane, where the strata have been distorted into the most grotesque forms. Again "Greywacke" says Phillips in his geology,‡ "is associated and often interstratified with slate, (Greywacke Slate) which it is impossible to distinguish sometimes from Clay Slate. This in its more simple

* Phillips, p. 154.
† Phillips, p. 148.
‡ p. 148.

state appears to consist of indurated clay frequently of a greenish colour, and which being laminated splits pretty readily, or the lamina sometimes separate by exposure." The most casual observer of the Slates of Carouge and Auvergne cannot fail to remark how completely those formations coincide with the description just given. But further he states that Greywacke mostly occurs in thin beds lying in the slates belonging to it. This is also the case with our rock. It also bears a strong resemblance to Greywacke Slate in its mineral contents. But to proceed.

Having ascended the bank we have above described, at Auvergne, we find ourselves on a terrace sloping to the S. E. and consisting of almost every variety of soil, from stiff heavy clay to peat earth and vegetable loam. This terrace is from its position easily drained, and from the great variety of soils as easily manured. Boulders are occasionally found upon its surface, much resembling those below. Its natural productions are elms, butternuts, birch, beech, maple and basswood. The soil near the church of Charlesbourg, is a rich vegetable loam, well suited to the production of garden stuff.

At the church of Charlesbourg we ascend another bank composed of horizontal beds of carboniferous or mountain limestone, rich in organic remains, among which we may enumerate—trilobites—terebratulœ—orthoceratites—nautili — ammonites — producti—belemnites and madrepores—but all of a very small size. Sulphuretted hydrogen springs are occasionally found—and the rock itself has a fetid odour. The stratum is continuous from Ange Gardien where it meets the Greywacke which it immediately overlies, to the river Jacques Cartier, which has in many places forced its way through it and excavated it into narrow and deep channels. At Beauport it immediately abuts upon the slate in unconformable beds, and its perpendicular wall-like elevation is very visible from the high road. It forms, when burnt, an excellent lime, with which the market of Quebec is supplied. From Beauport it is easily traced, bending along the foot of the mountains in a semicircular form as far as Indian Lorette, where the same wall-like elevation presents itself near the seigniorial mill below the falls of the St. Charles at that village; lime is also made from it here for the supply of the neighbourhood. A few loads are occasionally brought to market, but though equal in quality to the Beauport lime it cannot, compete with it in price, owing to the greater expense of transport, the distance being nearly double. At Charlesbourg, the rock from some cause or other has become silicified, and though consequently of more value as a building material—the lime produced from its calcination is inferior.

Wherever this rock presents itself at Indian Lorette and in that vicinity, it is found to rest on the sienite which forms the mountain chain north of Quebec. At the opposite extremity, viz., at the river Montmorenci, the bed of the river is also sienitic upon which the horizontal beds of limestone elevate themselves to form its banks. This is very conspicuous at the "natural steps," where the torrent has made a breach completely through the limestone and worn its way to the substratum of sienite. The debris formed by this denudation of the substratum is visible in the rolled pebbles of limestone which are found below the falls. At both these points, viz: at Indian Lorette and at Montmorenci above the falls, the slate formation is wanting, but at Beauport its position is very distinct, resting upon the sienite and inferior to the limestone beds. From the position of these beds, though perhaps not very probable, it is not wholly impossible that a coal basin may at some future period be discovered, not perhaps in the immediate vicinity of Quebec, yet at no very great distance from it. I believe it is no longer doubted that the beds we have described are analogous in character aud composition to the carboniferous limestone of England. Now in England as far as we know, the carboniferous limestone always forms the bed and sides of the great coal basins. The subsidence of the rock in many parts having formed bowl-like cavities in which the coal measures are deposited. Such basins may exist in our carboniferous limestone, though not yet discovered. It does not indeed follow that every carboniferous limestone contains the coal measures, but this much we know, that although the coal measures are occasionally found even in the Greywacke series and other rocks, yet they are of most frequent occurrence in the carboniferous group.

From the limestone ridge to the mountains another terrace very much resembling the last described extends itself—the soil consisting chiefly of peat and sand with occasional boulders interspersed.—I ought perhaps rather to call it a valley than a terrace, as the limestone above described forms a ridge separating the one valley or terrace from the other. Small streams traverse this valley, bounding the foot of the mountains and emptying themselves into the river Jacques Cartier. The peaty nature of the soil through which they run has given them a deep black colour and a soft mawkish taste—marsh plants are found abundantly along their banks, which are low, and in spring and autumn usually overflowed. The forests of this locality contain most of the shrubs, and trees common in the vicinity of Quebec, and already enumerated, except the oak,

which I have only found in the woods of Sillery and on the Island of Orleans. The valley is difficult of drainage from its low position, and its soil not among the most fertile.

We have now reached the mountains, and as we ascend we find ourselves on a ridge of sienite which every where presents its smooth rounded surface. This rock is remarkably hard and crops out so frequently as to render the cultivation of these hills absolutely impossible. Very large trees however find support for themselves by forcing their roots into the interstices of the rock and apparently deriving nourishment from the rock itself. Trees of all kinds have thus spread themselves over these otherwise barren mountains, forming a natural screen which protects the valleys beneath from the piercing winds that blow during winter from the north and north east. It is much to be regretted that so little judgment is shown in stripping these mountains of the clothing which nature has given them. Deprived of their shelter the valleys cannot fail to suffer, and the owners will find when it is too late to remedy the evil, the effects of their indiscretion, by the partial or even total failure of their crops.

Embosomed in these mountains are found frequent lakes abounding in trout, round which numerous emigrants have located themselves. The soil however is not such as will reward their labours, being chiefly siliceous with numerous boulders interspersed so thickly as in many places to prevent the operation of the plough. The lapse of centuries has deposited on these sterile sands, a thin vegetable surface arising from the accumulation from age to age of the leafy spoils of the forest—but a few years will exhaust the scanty nourishment thus afforded; the crops will deteriorate, and the settler, at so great a distance from town, unable to procure sufficient animal or vegetable manure for his crops and without a prospect, embosomed as he find himself among granitic hills, of obtaining a cheap succedaneum from the mineral world, will be unable to compete with his neighbour of the plain and still more with the graziers of the eastern townships, who may reasonably be expected in a few years to be the sole suppliers of the live stock required for the use of this city and its shipping.

But though, in a manner, useless in an agricultural point of view, we may yet look for many useful products to be hereafter derived from these mountains. For instance, they might be quarried to any extent for building materials, which they would afford at least as good as that of the Quincy granite of the neighbouring State of Massachusset s,now exported in very large quantities to every part of the Union. Many of the sienites

which lie in this range of hills are very compact, and well calculated to stand the ravages of time and exposure to the great changes of temperature to which we are liable. Indeed, from the small quantity of felspar which they contain, they might almost be considered as indestructible. We may also anticipate the discovery of the best Millstones;—Statuary Marble; Iron and other ores, such as Galena and Tin,—Blende,—Native Copper and its ores,—and, possibly, even Mercury. Graphite, better known under the name of "Black Lead," and some other minerals, have already been discovered. The precious metals are not usually found in granite, though frequently met with in Gneiss and Mica slate, and in Talcose Chlorite, which all are among the primitive formations, and usually accompany each other. A large mass of native gold has recently been discovered in a small stream not thirty miles from Quebec on the opposite side, of the river probably washed from its position in the Talcose Chlorite of that neighborhood. The discovery of Anthracite, or even bituminous coal, in one or other of the strata by which we are surrounded, is neither impossible nor wholly improbable. In the neighbouring States the great coal field of Pennsylvania is said to occur in the higher beds of Greywacke. The next great deposite of Anthracite occurs still lower in the series of rocks, and the Anthracite of Worcester is said to occur in an imperfect Mica slate associated with Gneiss. At the Boccage in Calvados, Lower Normandy, *coal measures* with their usual plants have been recently discovered; and they occur in the same relative position at Magdeburg; while in England they are also occasionally found in sand-stone beds that alternate with mountain lime-stone.* All these rocks exist either in our mountains or at their base. Mr. De la Beche, in his Geological Manual,† states of the carboniferous deposites of the Netherlands, that they would appear to be continued into Germany to those deposites which repose on the Greywacke rocks in that part of Europe. At Saarbruck and the neighboring country the coal measures he says are abundant, and rest, where trappean rocks are not interposed, upon part of the Greywacke mass.

In Poland M. Pasch describes the more ancient bed of coal as passing into the Greywacke on which they repose. According to M. Sternburg red sand-stone and red porphyry accompany the deposites of coal in Bohemia.

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* Phil. Mag. Vol. 7. No. 38. p. 152.

† Amer. Ed. p. 421.

Mr. De la Beche further informs us* that the coal deposites of Central France rest on Granite, Gneiss, Mica slate &c., without the intervention of any lime-stones, sand-stones, or slates, which can be distincty referred to the carboniferous lime-stone, old red sand-stone, or Greywacke. At St. George, Châtellaison, the coal measures also rest on Gneiss and Mica slate. But enough has been said to show, that the anticipated discovery of coal in some one or other of the strata by which we are surrounded, is no Utopian prospect.

It remains for me, in conclusion, to make a few remarks upon the boulders which are found so frequently in the tract of country we have been describing. As might have been supposed from the nature of the mountain range, they are altogether primitive. They exist in abundance in the plain and upon the terraces, and are also found in vast numbers upon the ridge of Quebec itself. Their position in this last-named locality is not a little extraordinary, and the question naturally suggests itself, how came they in such a position, perched on a long narrow ridge, nearly precipitous on both sides, and yet presenting a rough and, in some instances, angular appearance? I think, from their elevated position and the appearance that they present, the deduction may safely be drawn, that the ridge did not exist at its present elevation at the period when these masses were deposited on its surface,—because, 1st, if such had been the case, we should certainly have found some stray mass or other lodged in cavities or on the ledges that occur in the precipitous sides of the ridge—but we do not find them. 2nd. Because, had the ridge existed it is not probable, calculating the force of water required to raise these huge masses to their present elevation, that they would have been left where they are now found on the very brink of the precipice, the farthest removed from the mountain, from which they probably derive their origin; inasmuch as the wave descending the opposite precipice would natur- by its own weight, carry with it the opposing masses. 3rd. Supposing these boulders to come from the northern range of mountains, if they had been quietly deposited at the bottom of a lake, their edges would not be much worn down by the small degree of friction they would meet with in their descent, and we should expect to find them occasionally presenting sharp prominences and a rough angular appearance, and such they do present; on the contrary, if we suppose them to have been raised by the repeated action of the waves, the constant trituration

* Am. Ed. p. 422.

they would meet with against the rocky sides of the ridge, would necessarily remove each angle and leave them like other water-worn masses, smooth and rounded. 4th. We can hardly suppose them to be the produce of diluvial action, for they are not smooth enough to have been carried from any considerable distance, and had they come, as most probably they did, from the mountains of the neighborhood, they are too small to have resisted the diluvial current, and would have been carried much farther to the south. But, supposing the country in which they are found to have at one time formed the bottom of a great lake, we can imagine the waves of such a lake sufficient to have rolled these masses down an inclined plane, such as the appearance of the country now exhibits, but by no means sufficient to have raised them to their present elevation; lastly, there are no existing analogies which will warrant the supposition of their having been so raised.

There remains, then, but one conclusion to be drawn, which is this:—that these boulders were deposited at the bottom of a great lake and that the ridge on which they are now found, originally formed part of the bottom of the lake, from which, subsequently to the deposition of these masses, it was raised to its present height by the subterranean action of fire; I think I am borne out in this opinion by the distorted appearance of the strata of slate rock at Quebec, in some places nearly vertical, in others broken and contorted—here presenting an appearance of liquefaction by heat, there protruding from its pores a species of petroleum and springs of sulphuretted hydrogen, all of which might be expected in a stratum acted upon by volcanic force. I think also that a farther corroboration may be found in the existence of those extremely hard nodules of green jasper, already alluded to, which are found near St. John's Gate.

ART. XVIII. ON THE EFFECT OF CLEARING AND CULTIVATION ON CLIMATE, AND ON THE SITUATIONS MOST FAVORABLE TO THE DEPOSITION OF HOAR FROST AND DEW; BY WM. KELLY, M. D.

[Read 20th February, 1836.]

Ever since the first settlement of North America, the opinion appears to have obtained amongst the inhabitants themselves, as well as amongst scientific men, that the climate was gradually ameliorated, or rendered more temperate, in consequence of the clearing away of the woods, and the progress of cultivation.—For a long time it was supposed, that the climate of the American colonies would become as mild and equable as that of Europe, when the country should be cultivated to the same extent; and although such a change is now no longer expected by philosophers, since the causes of the difference of climate in the northern parts of the two hemispheres are better understood, nevertheless, much importance is still generally attached to the effects of clearing, and great hopes entertained of the amount of amelioration which will result when the country is fully cultivated. If, however, we compare the present climate of Canada with that which obtained two hundred years since, as far as it can be made out from the writings of the earliest settlers, we find no perceptible difference. The length and severity of the winter, the amount of snow that fell, and the time when plants first appeared in spring, were the same then as now.

It is easy to understand how philosophers may be occasionally led astray by pursuing a favorite theory, or philanthropists by the hope of a favorable change in any thing which influences the comfort or prosperity of mankind; but we do not so readily see why, in this case, the opinion of a gradual improvement in the climate should be held by the colonists themselves, contrary to what, from a general view, would appear to be the real state of the matter. My attention was directed to this subject some years ago, when preparing a paper on the climate of Canada; and as some facts which came to my knowledge since that time appear to me to cast considerable light on the subject, and would, if confirmed by the observations of others, probably afford a satisfactory solution of the difficulty, I venture to submit them for the consideration of the society.

Having noticed in some newly cleared spots in the vicinity of Gaspé basin, that the potatoe tops were destroyed by frost in the latter part of September, whilst the potatoe fields in the open ground about the harbour remained uninjured,—I made enquiries concerning the circumstance, and was informed by elderly persons of considerable intelligence, that, when they first came to Gaspé, their fields were very liable to injury from hoar frosts, both in the spring and fall; but that, as the country was gradually cleared about them, they suffered less from this cause; though the new settlers, particularly if surrounded by the forest, continued to be much affected by it.—The same persons asserted, that the climate where they lived was greatly improved within their own memory, in consequence of the clearing, and that such, no doubt, would be the case with the spot I mentioned, (about three miles distant), when the clearing and cultivation should extend so far. I found this account corroborated on further enquiry;—I was informed that the clear spots which are surrounded by woods, are particularly liable to hoar frosts in the spring and autumn; and that frosts occurred in such places, and in the vicinity of water courses, when the comparatively open country was free from them.—When any of our parties pitched their tents near the exits of rivers, they found the nights colder, and observed hoar frosts to occur more frequently, than those whose encampments were differently situated.

If such is generally the fact, it gives a ready solution of the difficulty above alluded to. An untimely hoar frost which nips the early shoots of spring, or the unripe fruits of autumn, would impress the mind of the settler with the idea of a severe climate, more than a great intensity of cold at seasons when his crops were not in a situation to suffer from it; and a less frequent occurrence of these frosts would be, for all his practical purposes, a great improvement in the climate, even though the mean temperature of the year remained unchanged. Indeed, it is not easy to imagine any material difference in the mean temperature of two places, at equal elevations, and within the circuit of a few miles; and it is probable, that the same causes that tend to produce cold at night in this case, would favor the production of a compensating increase of heat by day.

The principal cause of hoar frost in these situations appears to be the shelter afforded by the surrounding forest. The cleared spot is beneath the general level, and is consequently little acted on by light winds: hence on clear nights, the effects of radiation become more intense. There is in fact a calm in such spots

while the more open space has the benefit of currents of air. The cleared spot resembles those shallow pits that are made in India, for the purpose of obtaining ice, when the cold on the surface generally does not descend to the freezing point. The same shelter causes an accumulation of heat in these spots during the day. The vegetable productions, thus alternately exposed to severe cold at night, and heat by day, are rendered torpid by the one, and overstimulated by the other, hence they perish prematurely.

According to the generally-received theory of dew and hoar frost, this shelter is the only evident circumstance, in this particular case, that can influence their production. But the fact of frosts occurring at the same time, in the vicinity of streams and rivers, even where no clearance had been made, would lead us to infer that moisture also was in some way concerned in producing the cold. In every country, frosts are known to occur in sheltered valleys, particularly when the surface is wet, although the dry exposed upland escapes. Yet the higher lands can radiate more freely on all sides than the low. The usual mode of accounting for a fact, so opposed to the received theory of dew, and hoar frost, by attributing it to masses of air cooled on the hills, becoming thus specifically heavier, and falling, or rolling down into the valleys, is more ingenious than satisfactory. The cleared spots within the forest are probably moister than the open country: as from their comparatively small size, they must in some degree participate in the state of the surrounding woods. That the forests are wetter than the cleared lands is inferred by the greater amount of drainage from them: for whatever may be the effect of clearing on the mean temperature of a country, we find here that it is followed by a diminution of the quantity of water in the rivers that flow through it: small streams becoming nearly dry, and large ones, that were just navigable, when the forest was untouched, ceasing to be so, as cultivation is generally extended over the country.

Perhaps there is no doctrine in Meteorology so well established as Dr. Wells' theory of dew and hoar frost. His experiments seem to have demonstrated, beyond doubt, that the cold of the surfaces, which causes the deposition, is produced solely by radiation, and is quite independent of evaporation. Yet the observer of natural phenomena will often find it extremely difficult to account by radiation alone for all the circumstances that, in many instances attend, and seem to influence the deposition of dew and hoar frost. Dew is deposited at sea often under circumstances that usually prevent it from appearing on land.

Thus I have seen heavy dew, on board ship, on clear nights, though the wind was fresh and constant: I have also seen it under similar circumstances, on small islands, and near the shores of the main. I think its deposition has been less affected by passing clouds, even though they occupied a considerable part of the sky, than I expected from theory. And I have seen, on shipboard, a copious dew formed, nearly two hours before sunset, when the air was highly charged with vapour.

I do not cite those instances as subversive of the theory which makes radiation the sole cause of dew, for they may be reconciled to it without much difficulty. Perhaps they merely shew that when the air is charged with moisture, the slight cooling of the surface, that occurs notwithstanding winds or passing clouds, is often sufficient to cause its deposition, though it would not have had such effect under the same circumstances of wind and sky, combined with a drier state of the air.

The deposition of dew or hoar frost however may be promoted in some degree by evaporation, in as far, as it alone, in the absence of the sun, would reduce a warm wet surface to the temperature of the dew point of the air. If of two portions of the same surface, equally heated during the day, one is dry, and the other wet, it is evident that, when the sun sets, the wet one, in consequence of the evaporation from it will have its temperature reduced more quickly than the dry. The reduction of temperature from this cause cannot proceed lower than the dew point of the air, and may not even reach so far; still concurring with that from radiation, the combined effect may in many cases, be sufficient to cause deposition from the air, when it would not be effected by the cold resulting from radiation alone.

ART. XIX.—A METHOD FOR PREVENTING THE LIQUID CONDENSATION OF SMOKE IN METALLIC FLUES. BY WILLIAM SHEPPARD, OF WOODFIELD.

READ, 21ST FEBRUARY, 1835.

As it comes within the scope of the Literary and Historical Society's views to promote improvements in the useful Arts, I submit for its consideration a successful application of a principle in physical science to the removal of an annoyance to which, in the winter season—some of our Canadian dwellings are subject. I allude to dripping from the pipes or flues of our ordinary close stoves, with which our housekeepers are sometimes plagued.

Such as have had the misfortune to contend with this unpleasant source of annoyance can duly appreciate all its attendant evils—floors are stained, furniture spoiled, and the house filled with a disagreeable, unwholesome and destructive exhalation; creating domestic murmurs, and wishes for a remedy.

Our ordinary fuel for close stoves—wood of different kinds—is seldom free from moisture, being filled with the sap of the tree, and with water in a greater or less degree. In using fuel of this description, the greater part of the moisture is converted into steam, carrying with it in ascending the flue, the pyroligneous acid contained in the wood. On reaching a colder medium, the steam—imbued with carbon—is condensed into a liquid, and shews itself to our horror oozing through the joints of the flue, in the shape of a disgusting black liquor.

The usual palliative in such a case is to suspend beneath the pipe a tinplate gutter, to receive and convey the dropping liquid to a receptacle at one end of the room. But this resource often fails to be attended with the desired end, for this liquid being very penetrating and corrosive, will find for itself a passage through the joints of the gutter, and so drop to the floor; the reservoir will also overflow, if not regularly attended to.

The announcement of an effectual preventative for such a source of discomfort, it is supposed will be acceptable to those who have felt the inconvenience.

The prevention of this evil I think I have accomplished by the application of a well known principle in Science. Perhaps I may have been preceded by others in the use of the principle in this particular case; but, if so, it has not come to my knowledge.

The obvious remedy is to keep the surface of the pipe from contact with air cold enough to cause the condensation of the contained steam and rarified acid. The discovery, if so it may be called, consists in surrounding the stove-pipe with another tube of metal, of a diameter just large enough to allow it to pass freely over the former, and which should be so fixed as that a clear space may exist between the two: the swaged mouldings now usually made at the joinings of smoke flues, to regulate the length of the overlap, being quite sufficient to keep the outside tube from coming in contact with the flue; except at one point merely of the moulding, which is of no consequence. The outside tube may be made of the thinnest material, or of light tinplates; and may be made ornamental if so required. In most cases it will be found sufficient to apply an outer pipe to the space between the last angle of the flue and the chimney, where the smoke having parted with its heat in its passage through the pipe to the air of the apartment, will be more liable to become condensed into liquid.

I have been led to this result by an unfortunate dripping pipe of my own. A stove placed on the second floor of my house, with the assistance of the pipe passing into the attic above, heats both stories: but the pipe is necessarily long and contains five angles; it was therefore subject to the inconvenience of dripping between the last elbow and the chimney. Here was a good opportunity for an experiment; and having opportunely a suitable tube on hand, I passed a portion of it over the part of the flue subject to drip, on the occasion of the first cleaning of the pipe, which occurred in November last; and I have been quite gratified with the satisfactory result. No vexation from black dripping liquor has occurred since the alteration: and it is moreover pleasing to announce that the alteration has been attended with another good consequence; which is, that the pipe does not now require cleaning so frequently as it did before the experiment. Formerly, if not taken down every fortnight and well brushed out, we were annoyed by the smoke finding a passage through the joints of the flue into the rooms, instead of wholly proceeding to the chimney and thence off to the air. Cleaning the pipe once in six or eight weeks is now found to be

sufficient. The coating of this part of the pipe, no doubt, allows the carbon of the smoke to pass off without being precipitated upon the inside of the pipe in such abundance as before the application.

It will perhaps be supposed that this plan is attended by a considerable loss of heat to the apartments. This possibly may be the case in a small degree; yet I have not found it to have such an effect to any extent; the outside pipe becoming nearly as hot as the single one did previously. But, even if this should be a partial consequence, the benefits gained are an ample compensation.

The first outlay will be greater, but the pipes not being exposed to corrosion by the pyroligneous acid, will wear much better; and the trouble and annoyance of cleaning them will be greatly diminished.

ART. XX.—ON THE TEMPERATURE OF THE SURFACE WATER OVER THE BANKS, AND NEAR THE SHORES OF THE GULF OF ST. LAWRENCE; BY WILLIAM KELLY, M. D.

[Read 5th March, 1836.]

The temperature of the ocean is known to vary in particular situations, independent of the changes that result from difference of latitude. The most striking instance, perhaps, of these varieties in the temperature of the surface, is that observed in passing from the Gulf stream, to the neighboring banks of Newfoundland. Differences of the same kind, but less in degree, have been observed in other situations. Thus, Baron Humboldt, Doctor Davy, and other travellers, who paid particular attention to the temperature of the surface of the ocean, have observed, that, in most instances, it suffered a marked diminution when they were passing over banks, or approaching land. During the process of the survey of the Gulf of St. Lawrence, we have had frequent opportunities of making similar observations, and for the most part, with similar results. Whenever we had occasion to observe the temperature of the surface over banks or shoals, away from the land, we found it always less than where the water was deep; but, in approaching land from the centre of the Gulf, though we generally found the surface colder, yet it was not invariably so; and, in some cases, it was warmer near the land, than at a distance from it. In harbors, also, a great variety of temperature was observed—the water being one day comparatively warm; on the next, perhaps, intensely cold. I shall endeavor to point out the circumstances that accompanied and seemed to influence these changes, as far as they came under my notice, with the hope of throwing some light on the general question;—for, as the Gulf is a sea on a small scale, a knowledge of the causes which influence the temperature of its surface, can scarcely fail to be of use in any enquiry that is made into the causes of the variations of temperature in similar positions in the ocean.

On a former occasion, I laid before the society some remarks on the temperature of the water of the estuary and adjoining parts of the gulf, which have since appeared in the TRANSACTIONS. It was shown, that the great mass of the water there, was cold; and that the upper stratum of warmer water, usually observed,

was of inconsiderable depth; that it was never seen in some situations, and ceased to be distinguished in any part of the estuary, when the water was much agitated. In the Gulf, I found, that, although the main body of the water was cold, as in the estuary, yet the upper stratum of warm water was of greater depth; and hence, the temperature of the surface in the gulf was not so much, nor so readily reduced by agitation, as in the estuary. The temperature of the water was not found to decrease regularly, in proportion to the depth, in either situation. On one occasion, the water, brought from a depth of 20 fathoms, was warmer than what was brought from 10, or from 47 fathoms; and, in every instance, we found it warmer at 100 fathoms depth, than at 50. When, however, portions of water, drawn from different depths, were examined by the hydrometer, the specific gravity was always found to be greater in those which came from greater depths—the saline contents of the strata thus giving them a relative position different, in some instances, from that which they would occupy, if their specific gravities were influenced by their temperature alone.

If we suppose, in accordance with our observations, the waters of the Gulf of St. Lawrence to be divided into strata of different temperatures, the position of these strata will bear a striking analogy to what the geologist observes in some great secondary basins, where a stratum that lies deep towards the centre, often crops out at the surface, all round its edges.

The varieties in the temperature of the surface water, near the shore, seem to be owing to three causes: 1st,—The banks, shoals, and rocks, which resist the currents arising from tides, or other currents that affect the whole mass of the water; 2nd,—The rivers that open on the coast; and, 3rd,—The winds.

When the lower cold strata of water have their course retarded by the obstacles mentioned in the first case, and advance more slowly, in consequence of the friction against the opposing body, the strata next above, retaining their original velocity, have a tendency to rise over the obstruction, and thus to attain a higher level than they previously occupied. When the obstruction is small, the current weak, or the upper warm stratum of considerable depth, no perceptible effect on the surface ensues; but, in contrary circumstances, the lower strata are brought to the surface, the result of which is a considerable diminution of its temperature. In this way, the cold ordinarily observed over banks, and near shores, may, I think, be explained. *

* The difference of velocities, resulting from inequalities of the bottom, is

In the Gulf, we always find the water of the rivers warmer than the sea. As the fresh water, from its inferior specific gravity, has a tendency to float on the surface of the salt, whenever a large river, or several small ones, enter the sea, they tend to make the surface warmer than in other situations.

The influence of the winds is two-fold. The agitation they produce, by mixing all the strata, tends materially to cool the surface; but their direction seems also to have a considerable effect on the water near the shore, especially when combined with other causes. When they blow on the land, without sufficient force to mingle completely the surface water with the colder water beneath, they tend to propel the warmer surface water of the central parts of the gulf, nearer to, or on the coast, and to keep the water of the rivers also close to it. When the winds are off the land, they prevent the water of the rivers from acumulating near it, and force the warm surface water of the central parts further from the shore.*

In the paper already alluded to, I attributed the effect of the winds on the surface, solely to the agitation they produced; and such seemed to be the legitimate result of our observations up to that time; but, along the coast of Labrador, I found their effect in cooling the surface, to be, in many instances, unconnected with their power of agitating the sea in the immediate vicintty. The easterly sea winds, which most readily reduce the temperature of the surface in the estuary, are generally accompanied here by an increase of its temperature; and the water is coldest during the prevalence of westerly winds, particularly when, by having some northing, they come direct off the land. These changes of temperature in the water, have no relation to the temperature of the air at the time,—as during summer, the winds from the land are warm, and those from the sea, cold.

Winds off the land are generally drier than sea breezes—hence their passage over the surface of the water is attended with much greater evaporation from it;—perhaps this is another reason why the surface is colder with winds off the land.

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probably the cause of the whirls and eddies which we often see when the tide is strong. These whirls and eddies mingle the surface and deep water completely. The interruption to currents, caused by a strait or narrowing of the shores, seems also to have a similar effect. We found the greatest cold in the surface water at the strait of Belleisle, at Mingan, and Point de Monts, where the width is considerably diminished; and near Bic, where the river becomes narrow and shoal at the same time.

* Some years ago, I was in the habit of bathing at the head of a bay on the west coast of Ireland, and remember well that the water was always warm when it was much agitated by westererly winds; whilst it was often

The effect of land and sea winds on the surface water, is more remarkable in the harbors immediately on the main, such as Mingan and Kegashka, than in those which are formed by islands some distance from it, as Wapitiguu.*

In the strait of Belleisle, we found the water warmer on the Newfoundland side, than on the Labrador shore. The only circumstance that seemed to account for this, was, the evidently greater strength of the tides on the Labrador side. As the temperature of the water on the Newfoundland side corresponds very nearly with that observed at a distance from the shore, in the neighboring part of the Gulf, it seems probable that a slight current outward may exist on this side,—being a kind of eddy to the usual current in, which is so evident on the other. No large rivers empty themselves on this part of the Newfoundland coast.

The remarks on the temperature of the water at different depths, were reduced from the following observations :—On the 19th of June, 1832, off Point de Monts, the water at the surface was 43° ; at the depth of 10 fathoms, 37°. 5 ; at 20 fathoms, 39° ; at 47 fathoms, 33° ; at 104 fathoms, 36°. The increase of temperature between the depths of 10 and 47 fathoms, made us suspect the accuracy of the result on the first trial ; but a second one confirmed it. The specific gravities, however, increased regularly —being 1:019, 1:023, 1:0246, 1:026, and 1:0275. At the same place, on the 9th of July, 1831, the temperature of the surface was 57° ; at a depth of 4 fathoms, 40° ; at 10 fathoms, 38° ; at 100 fathoms, 35°. The specific gravity at the surface, was 1:017—increasing to the greatest depth, where it was 1:0275. On the previous day, the temperature of the surface off Matane, (some miles higher up the estuary,) was 54° ; at a depth of 50 fathoms, 34°. In the Gulf, several miles off the north shore of Anticosti, the surface water on the 10th of August, was 54° ; at a depth of 10 fathoms, 46° ; at 30 fathoms, 34°. 5 ; at 50 fathoms, 34° ; and at 100 fathoms, 37°. The specific gravities were in accordance with the depth—increasing from 1.0225, at the surface, to 1.027 at the greatest depth. In Min-

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very cold in calms, or with winds off the land. But, as this was a matter of feeling, not measurement, it cannot go for much. I was, however, forcibly reminded of it by my observations on the Labrador coast.

* This harbor is on the outside of a labyrinth of rocks and small islands, that line the coast for several leagues, in both directions. The warm water of the rivers of the main must accumulate, in some degree, within these islands, on ordinary occasions ; and the first effect of land winds would only be, to propel it towards the harbor on the outside.

gan harbor, on the 2nd of September, 1832, at 10 A. M., the water of the surface was 53°; whilst at the depth of 10 inches, (the length of the thermometer,) it was only 47°.*

We had a remarkable instance of the coldness of the water over shoals or banks on the 29th June, 1832. We found the temperature of the surface only 33°, in passing over a shoal ledge, that runs out to a considerable distance from the Mingan Island, and, by its situation, must obstruct the course of the tides, between the northern parts of the gulf and the estuary. On the previous days we found the water in the estuary 47° or 48°. It was nearly calm as we passed the ledge, but there was a considerable swell.

The most remarkable changes in the temperature of the water in a harbour occurred, as I have already mentioned, in Kegashka; where we lay at anchor from the 15th to the 30th August, 1832. This is a small harbour on the Labrador coast: the entrance is narrow, and divided into two channels by a small rocky island. It stretches to a comparatively great length within, in the line of the coast: but the chief part of this extent is shoal. The coast outside, both to the E. and W. is broken by numerous rocks, many of which lie some miles from the main. There is no river in the harbour, but rivers and streams are numerous along the coast. On the 14th August, at 9 A. M, the temperature of the surface water, some leagues from the land, was 53°, the air 54°, winds light and variable. On the 15th, in Kegashka, at the same hour, the air was 56°, thewater 48°. There was a dense fog on the surface: it had been calm all night, but there was a considerable swell. On the 18th after two days of fresh westerly winds, blowing along, and rather off

* As the depth of water in the places where these examinations were made, was little more than 100 fathoms, it seemed probable that the increase of temperature at that depth might have been owing to that derived from the bottom itself, which would probably have the same temperature as the mean of the earth ashore (about40°). I was consequently desirous of making a trial where the total depth was much greater. On the 17th of June, 1836, we were becalmed about 12 miles S. E. of Point des Monts. The temperature of the surface was 51°—specific gravity, 1.0180; at a depth of five fathoms, temperature 42°5; at 10 fathoms, temperature 38°; at 30 fathoms, temperature 32°5—specific gravity, 1,0261; at 50 fathoms, temperature 33°—specific gravity, 1,0266; at 80 fathoms, temperature 34°—specific gravity, 1,0266; at 110 fathoms, temperature 35°—specific gravity, 1.0271; at 150 fathoms, temperature 35°—specific gravity, 1.0278. The specific gravities were ascertained in each case where the water had acquired a temperature of 50°. It was evident here that the increase of temperature at the depth of 100 fathoms, was unconnected with the temperature of the bottom; but we may remark, that, though the temperature of the water did not alter below this depth, yet the specific gravity continued to increase.

the land, the temperature of the surface fell to 38°. From the 18th to the 28th it fluctuated between 38° and 52°, as the winds were more or less fresh, off or on the shore. On the 28th a south wind blew directly on the shore. The water rose to 55° that evening, and varied between this point, and 52° for the two following days; the wind being light, shifting a little to the eastward, and blowing directly on the coast.

Off Mingan harbour, on the 31st, the surface water was 51°, the air 56°; on that night there was a very fresh wind from the northward, and on the morning of the 1st September, the water in the harbour was 39°, the air 52°. Mingan harbour is formed by an island lying parallel with the coast; a considerable river empties itself into the eastern end of it; the temperature of the water of the river on that day was 51°.*

On the 6th of August 1832, the water in the offing was 51°, the air 55°: near the shore, soon after, we found the water 55°; the temperature of the air had fallen in the mean time to 53°. This was at Nabisippi, where a river empties itself on the open coast.

The difference of the temperature of the water near the shore, from that in the offing, was observed also on the south coast. On the 10th October, near Cape Gaspé, the surface was 41°; at some distance out, 43°. On the 11th, at 9 A. M, the surface water, near Mount Louis, was 41°, air 48°: at 10 we had got out about 7 miles, with a fresh breeze from the westward; the surface was 47°, the air 52°.

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*On the 12th October, in the bay of Seven Islands, at 9 A. M, the air was 50°, the water 46°, on the 13th the air 44°, the water 42°, on the 14th both air and water 39°. There had been fresh breezes off the land during the three days. Two rivers of moderate size empty themselves into this bay.

ART. XXI.—A COLLECTION AND CRITICAL EXAMINATION* OF THE PASSAGES IN GREEK AUTHORS, IN WHICH MENTION IS MADE OF THE HYPERBOREANS. (PRIZE ESSAY.) BY THE HON. A. W. COCHRAN.

[The subject of the following paper being out of the ordinary range of literary research, it is proper to state the circumstances which have given occasion to the composition and publication of it :—The Right Honble. Sir Charles Grey when lately in this Province as one of His Majesty's Commissioners of Inquiry, having become a member of the Literary and Historical Society, placed at the disposal of the Society a prize for the best paper "containing a collection and critical examination of the passages in Greek authors in which mention is made of the Hyperboreans."

The Council of the Society having accordingly offered this among other prize subjects for competition, the following essay was adjudged to be entitled to the prize offered by Sir C. Grey, and the Society deemed it also worthy of publication.]

The subject which has been chosen by an eminent and accomplished person, and adopted by the Literary and Historical Society as a subject for a prize essay, is one so involved in the obscurity of a remote and uninformed antiquity, and the investigation of it is so little aided by the lights of ancient history or geography, that the enquirer enters upon it with little more than dim conjecture to guide him.

The existence of a Hyperborean people is indeed mentioned in several Greek authors; but the very fact of that existence is made a matter of doubt by the Historian, who is himself to be resorted to, as the principal guide of our inquiries; and the geo-

*INTRODUCTORY NOTE.

The writer of this essay has felt himself limited by the precise terms in which the subject proposed by Sir C. Grey has been expressed, from going beyond a *collection* and *critical examination* of those passages of Greek authors (within his reach), "in which mention is made of the *Hyperboreans*." He has therefore abstained from entering upon any inquiry into various peculiarities in the customs, manners, laws and religion attributed by ancient Greek and Latin authors to those northern nations, near, or among whom the Hyperboreans were supposed to dwell; in which many singular resemblances between those nations and the Aborigines of North America, might have been traced, which would have added interest to this disquisition. But, in truth, having been led to the conclusion, that the term *Hyperborean* included all the northern nations of Europe, unknown, or little known to the ancients,—such an inquiry would, as he conceives, have been far beyond the possible contemplation of the proposer of the prize.

As the terms of the subject proposed, do not require *precise quotations* in the language of the original authors, he has in general, thought it sufficient, and more convenient, where the extracts would have been long, to give the sense of the passages in an exact rendering.

graphy as well as the history of the writers of Greece, (particularly those of Hellas or Greece proper) was so innacurate and imperfect, that we have little of certainty to rest upon, beyond the limits which that polished but vain nation fixed as the pale of civilization. Foreign travel, foreign commerce, and foreign navigation,—the sources from which geography has in more recent times derived its largest accessions, yielded it in those days but a feeble and uncertain light.

The mariner in his ill-found and ill-constructed bark, unaided by the compass, and guided only by the stars, or by land marks, in general clung timidly to the well-known shore, and seldom visited regions not connected with, or dependent on the country to which he himself belonged;—the merchant carried forth and brought home his wares, chiefly in journies by land,—oftentimes, indeed, long and toilsome and perilous,—but only where gain could be sought with the least danger;—the man of letters, however liberal curiosity might prompt him to enlarge his knowledge by travel, was deterred by fear, or by the universally prevailing contempt for the nations called barbarous, from investigating, among them, their history, their geography, or their actual condition. Even where countries were explored by ancient travellers, or became known to them by report, the want of adequate means of observing the latitude and longitude, rendered their geography in these points to a great degree inaccurate and uncertain; and the error under which they laboured, in believing that the earth was habitable only in temperate regions, retarded the improvements of the ancients in this science.*

In truth its boundaries were more enlarged by the march of the conqueror than the travels of the philosopher: Alexander the Great, took with him to the shores of the Ganges and Indus, and kept in his pay, men of science, who measured and delineated the movements of his armies; And Cæsar caused surveys to be made and itineraries to be prepared of the Roman empire, which he had so greatly extended.†

These observations apply to the state of geographical knowledge before the Christian Era; about which time Strabo travelled and wrote; and with little qualification they are not less applicable to the subsequent period of 136 years which elapsed from the death of Strabo to that of Ptolemy.

One eminent writer, indeed, the father of profane history, travelled through many of the countries of which he professes to give an account, and it is from him or through him that we de-

* D'Anville's Ancient Geography, vol. 1, p. 2.
† Robertson's historical disquisition, sec. 1.

rive some of the clearest and most intelligible notices which we have at the present day, respecting the existence and situation of a Hyperborean people. But, though an English author of some note* positively states that Herodotus claims the credit of having seen with his own eyes the regions north of the Euxine, of which he treats in his fourth book, we believe it will be found that he makes no such assertion; and it would appear that he did not even extend his personal researches to all the Grecian colonies in that quarter, much less to the interior of Scythia, or to the nations farther north: His information was evidently often obtained at second hand: and considering the remote period at which he wrote,—and the difficulties already glanced at, which he had to encounter in ascertaining the truth respecting distant places or facts,—we are rather disposed to admire the accuracy he has attained, than to blame the errors into which he may have fallen. Notwithstanding the tendency of his natural temperament to seize on what was marvellous or new, there are evident proofs throughout his work, of the caution and restraint which he practised in pursuing his inquiries, and forming his conclusions, and of the judgment, with which, so far as could be expected from a writer of his age, he sifted fact from fable.

Herodotus composed his historical work about 450 years before the Christian Era; and as he is the earliest extant prose writer who has mentioned the Hyperboreans as a nation, he deserves our first attention; Those who came after him, and who have touched upon this subject, will be found not only to have added little that is authentic or clear to the notices of it which he has given, but to have involved it in greater confusion and obscurity; so that the assertion of the Abbé Gedoyn will probably be discovered to be fully justified,—"Que les Grecs ne s'entendoient pas eux mêmes quand ils parloient des peuples Hyperboréens."

In the commencement of his 4th book, (or Melpomene) Herodotus, after treating of the origin of the Scythians, repeats in the 13th section the account given by one Aristeas of Proconnesus, of the early history of several nations north of the Euxine, but he quotes it only as what was current among the Greeks and Barbarians and without any language signifying his own approbation of it; for in the beginning of a former section† he had expressed his adoption of a different view ἐστι δε ηαι ἄλλος λογός ἐχων ὧδε, τῳ μαλιστα λεγομενῳ αυτός προσκεῖμαι He informs us that this Aristeas (who appears from Longinus

* Dr. Guthrie.
† (Section 11).

to have been the author of a poem on the wars between the Arimaspi,—a neighbouring people to the Hyperboreans, and the Gryphons), reported that he had visited the country of the Issedonians,—above, or beyond whom, (that is, to the northward), were the Arimaspi, a one-eyed nation; above them the Gryphons,* who guarded a golden treasure; above them the Hyperboreans, reaching to the sea; but Herodotus concludes by remarking, that the accounts given by this writer were at variance with those of the Scythians themselves;—and it is manifest that he does not attach any credit to them; for he afterwards observes, that, with respect to the countries beyond (or above) Scythia, (of which he himself was about to give a description), no accurate information could be obtained,—since he had never met with any person who had actually visited them; and that even Aristeas did not pretend to have travelled farther than to the Issedonian country; and the historian then proceeds to give what he solemnly avers to be as correct an account of these countries as he had been able, by diligent inquiry from others, to collect.

Beginning at the mouth of the Borysthenes, (now the Dnieper), "the centre of Maritime Scythia," he describes the nations to the west, the north, and the east. First, in ascending that river,† and to the westward of it, (upon and beyond the Hypanis, now the Bog), he notices the Callipidæ, (who were Scythian Greeks); next the Alazonés; above these the agricultural Scythians, (who carried on a corn-trade.‡); and above these the Neuri; but he represents the country to the *north-east* of these (*προς βορην ανεμον*),§ as an *uninhabited* desert, so far as was known. On the other side of the Borysthenes, the first tract which he names is Hylæa, or the wooded region; next to this the Agricultural Scythians again, extending in a N. E. direction up the Borysthenes, 13 days' journey,‖ or about 400 miles; be-

* The figure of the Gryphon, or Griffin, is borne on some of the ancient Græco-Scythian medals, or coins, found on the northern shores of the Black Sea.—(*Dr. Guthrie's Appendix.*)

† According to Herodotus, (b. 4, c. 53), the Borysthenes was navigable 40 days' journey, (1000 miles), N. eastward; or, according to a suggested emendation, 14 days' journey (350 miles).

‡ These people seem to have inhabited what is now Malo Russia, which is still a corn country, and exports that article from Odessa, near the mouth of the Bog.

§ That Boreas and Aquilo signified the N. E. wind—see Plin. Hist. Nat., lib. 2, c. 47; lib. 18, c. 34.

‖ Major Rennell is of opinion that there is here a mistake in the number of days' journies.

yond them a tract of desert; and then the *Anthropophagi*, or Cannibals, (not a Scythian nation); and above these still, to the N. E., he describes the whole region, in the same direction, as, without all doubt, a desert *uninhabited* as far as he knew, by any race of men.

Taking, again, the tract of country to the *east* of those last described, he mentions the Nomadian Scythians, dwelling in a treeless country, (the Steppes of Modern Russia); beyond these the Basilian or Royal tribe; to the N. E. of these the Melanchlæni,* or Black Mantles—beyond whom were tracts supposed to be *uninhabited* by man; and, after naming several other tribes more to the eastward and northward, he speaks of the Issedonians,† as well ascertained to inhabit a country still farther in the same direction; but states that the regions to the N. E. were unknown to the Issedonians or the neighbouring nations, except that *they* related that *there* was the race of one-eyed men and gryphons; that the Scythians had received this story from *them*; and that the Greeks had it from the Scythians,—and, taking it for true, gave these strange inhabitants the name of Arimaspi.‡

These geographical notices by Herodotus, with respect to the Scythians, have been dwelt upon at greater length than might appear necessary, in consequence of an opinion expressed by a well-informed author§ already alluded to, who wrote on the spot, and has devoted a separate essay to this particular enquiry—that the country of the Hyperboreans may, on the authority of Herodotus, be fixed immediately to the north of the Issedonians, whom this writer would place about the 50th degree of N. lat., where the Russian government of Kief is now laid down in the maps, south of Moscow; and there is the far greater authority of Sir William Jones—a man whose most casual *dicta* can be received only with the highest respect, and impugned with the greatest diffidence, who, in his 8th anniversary discourse before the Asiatic Society of Bengal, assumes, that the Hyperboreans were to be found by rounding the N. E. coast of Asiatic Russia, and coming thence westward; and is of opinion, "from what is

* According to Solinus (c. 20) this people dwelt at the sources of the Borysthenes.

† Ptolemy places this nation where Little Thibet is found in modern maps, far away from the position assigned by Herodotus.

‡ From two Scythian words, signifying *one-eyed;* and it has been supposed, with some appearance of reason, that the name was applied from the skill of the Scythians in the bow and arrow, in using which, they shut one eye to take aim.—(*Larcher's Herodotus.*) But another explanation of the name is suggested by Mr. Bryant, as will hereafter be seen.

§ Dr. Guthrie in his supplement to Mrs. Guthrie's tour in the Taurida.

known of their old religion and laws," that they were of Gothic or Hindoo origin. But we have no reason to suppose that this distinguished man meant to be understood as giving a deliberate opinion, founded on an examination of the whole authorities bearing on the question—as to the existence of a separate and distinct Hyperborean nation with an ascertained system of laws and religion ; nor does he dwell on the subject beyond the extent now mentioned. But it will be seen that, in describing the Scythian countries, Herodotus speaks of them as bounded to the N. and N. E. by *uninhabited* or unknown tracts ; and with respect to the Issedonians, in particular, he does not state them to be the neighbours of the Hyperboreans—but, on the contrary, throws discredit on the fabulous tales related by that people of the countries contiguous to them.

When he comes, however, to speak directly of the Hyperboreans themselves (in the 32nd section) his caution, and indeed incredulity are significantly shewn : " Of these Hyperborean people " he says, "neither the Scythians nor any of the inhabitants of these countries can give any account, excepting the Issedones, and even they as I think *say nothing*" (i. e. that can be depended upon) (ὡς δ᾽ἐγω δόκεω οὐδ᾽ οὗτοι λεγουσι οὐδεν;) " for if they did, the Scythians also would have spoken of them ; as they do of the one-eyed nation," &c. Evidently holding the same opinion or degree of belief with respect to the Hyperboreans as of the one eyed nation.

The Historian however then proceeds to relate the traditions current among the inhabitants of the Island of Delos respecting the Hyperboreans,—but without any expressions or indications of his own belief in them ; he states these traditions to be, that from the Hyperboreans, offerings for the temple at Delos were brought to the Scythians, packed in barley or wheaten straw ; that by the Scythians they were handed over to their neighbours ; and being then transferred from nation to nation, until they reached the Adriatic sea, they were thence carried southward, and taken in charge by the Greeks of Dodona,—passed from them across Greece to the Sinus Maliacus (or bay of Zeitoun,) thence through Eubœa to the city of Carystus at its southern extremity,—thence to Tenos (or Tino), and by the Tenians were borne to the Island of Delos, where the precious charge was to be deposited, as an offering to Apollo ; that these Hyperboreans had on a former occasion sent their offerings by two young women, who were escorted by five men of their country ; but as these had never returned, the Hyperboreans had been deterred from despatching another mission, and had adopted the method already

described of sending them by a circuitous route, from nation to nation : but after relating this Delian tradition, Herodotus adds significantly, that he had seen similar offerings made up by the Thracian and Pœonian women for their sacrifices to Diana,—seeming shrewdly to suspect (as Bishop Heber remarks, Hist. of the Cossacks, c. 26.) that the offerings sent to Delos were the workmanship of some devotees among the Thracians.

Recording farther these traditionary tales, he states that these young women having died at Delos, the inhabitants paid them certain posthumous honours, which he describes; and that even before they had arrived in the Island, two other Hyperborean virgins had come thither (according to the report of the Delians) with an offering to Lucina, bringing with them their own gods; —that to these also the inhabitants paid honours ; and that the Delian women collected alms for them, and introduced their names into a hymn composed by Olen, a Lycian poet, the author of other ancient hymns sung by the Islanders.

"Thus much (concludes the Historian) it was necessary to tell "of the Hyperboreans; for as to the story of Abaris, who was said "to be a Hyperborean, and to have gone round the earth upon "an arrow, and without eating, I will not speak of it."

Such are the notices we derive from the father of History respecting the Hyperboreans ; and they certainly seem hardly to amount even to the lowest degree of historical evidence,—to that founded on the testimony of hearsay ; for the author who reports what he had thus heard, does not even add, as he does to other relations in other places, the stamp of his own credit and belief ; but concludes his whole account with an expression, casting doubt on the existence of such a people, "Ει δε ειστι τινες Υπερβορεοι ανθρωποι." &c.

Before entering on an examination of some of the particulars of these Delian traditions, it may be convenient to refer at once to the concurring authorities respecting them, and respecting the Hyperboreans generally, which we find in other writers to whom we have had the opportunity of access.

Callimachus, who flourished about 200 years after Herodotus, composed a hymn on the island of Delos ; but the writer of these notes has not had it in his power to consult this author.—It is probable, however, that his account of the Hyperborean offerings brought to Delos, was drawn, in great part, from that of Herodotus ; it appears from authorities in which Callimachus is quoted, that that poet entirely agrees with Herodotus as to the route supposed to have been pursued by the Hyperboreans in coming to Delos ; he mentions the mission of Hyperborean

virgins; but differs from Herodotus as to the names of those who first arrived; and he speaks of Olen, the Lycian, who brought the hymns ascribed to him, from the borders of the Xanthus.

Diodorus Siculus, the next author to whom reference is to be had, wrote about 400 years after Herodotus, but his authority, in general, is not held by critics of equal weight; although he also travelled extensively, and laboured long in collecting materials for his work. As this author is not so frequently to be met with in this country as Herodotus, (there being, it is believed, but two copies in Quebec, only one of which is in the original Greek, and the other an old, and not very correct Latin version, printed in 1552), the writer is induced to add a transcript in the original language, of the account given by Diodorus respecting the Hyperboreans.

Ἡμεῖς δ' ἐπεὶ τὰ πρὸς ἄρκτους κεκλιμενα μέρη τῆς Ασίας ἠξιωσαμεν ἀναγραφῆς, οὐκ ἀνοικειον ἔιναι νομίζομεν τὰ περὶ τῶν Υπερβορέων μυθολογούμενα διελθεῖν. τῶν γὰρ τὰς παλαιὰς μυθολογιας ἀναγεγραφότων Ἑκατᾶιος, καί τινες ἕτεροι φασὶν, εν τοῖς ἀντιπέραν τῆς Κελτικῆς τόπόις κατὰ τὸν Ωκεανὸν, ἔιναι νῆσον οὐκ ἐλάττω τῆς Σικελίας,—ταύτην ὑπάρχεὶνμὲν κατὰ τὰς ἄρκτους, κατοικεῖσθαι δε ὑπὸ τῶν ὀνομαζομένων Ὑπερβορέων, ἀπό τοῦ πόρρωτέρω κεῖσθαι τῆς βορεῖου πνοῆς.—οὖσαν δ' αὐτην ἐυγέιον τε καὶ πάμφορον, ἔτι δὲ ἐυκρασίᾳ διαφέρουσαν, διττοὺς κατ, ἔτος ἐκφέρειν καρπούς. μυθολογοῦσι δε ἐν αὐτῇ τὴν Λητὼ γεγονέναι, διὸ καί τὸν Ἀπόλλω μάλιστα τῶν ἄλλων θεῶν παρ' αὐτοῖς τιμᾶσθαι—ἔῖναι δε αὐτοὺς ὥσπερ ἱερεῖς τινας Απόλλωνος, διὰ τὸ τὸν θεὸν τοῦτον καθ' ἡμέραν ὑπ' αὐτων ὑμνεῖσθαι μετ' ᾠδῆς συνεχῶς; καὶ τιμᾶσθαι διαφερόντως. ὑπάρχειν δε καὶ κατὰ τὴν νῆσον τέμενός τε Ἀπόλλωνος μεγαλοπρεπές καὶ ναὸν αξιόλογον, ἀναθήμασι πολλοῖς κεκοσμημένον, σφαιροειδη τω σχήματι; καὶ πόλιν μὲν ὑπάρχειν ἱερὰν τοῦ θεοῦ τούτου,—τῶν δὲ κατοικούντων αὐτὴν τοὺς πλειστους ειναι κιθαριστὰς, καὶ συνεχῶς ἐν τῷ ναῷ κιθαρίζοντας ὕμνους λέγειν τῷ θεῷ μετ' ᾠδῆς, ἀποσεμνύνοντας αὐτοῦ τας πράξεις. ἔχειν δὲ τοὺς Υπερβορέους ἰδίαν τινὰ διάλεκτον, καὶ πρὸς τοὺς Ἕλληνας οἰκειότατα διακεῖσθαι, καὶ μάλιστα πρὸς τους Ἀθηναίους καὶ Δηλίους, ἐκ παλαιῶν χρόνων παρειληφότας τὴν ἔυνοιαν ταύτην; καὶ τῶν Ἑλλήνων τινὰς μυθολογουσι παραβαλεῖν εις Ὑπερβορέυς, καὶ ἀναθήματα πολυτελῆ καταλιπεῖν, γράμμασιν Ἑλληνικοῖς ἐπιγεγραμμένα: ὡσαύτως δὲ καὶ ἐκ τῶν Ὑπερβορέων Ἄβαριν ἐις τὴν Ἑλλάδα καταντήσαντα τό παλαιὸν, ἀνασῶσαι τὴν προς Δηλίυς ἔυνοίαν τε καὶ συγγένειαν. φασὶ δὲ καί τὴν σελήνην ἐκ ταύτής τῆς νήσυ φαίνεσθαι παντελῶς ὀλίγον ἀπέχουσαν τῆς γῆς, καί τινας ἐξοχὰς γεώδεις εχουσαν φανεράς. λέγεται δὲ καὶ

τὸν θεὸν, δί ἐτῶν ἐννεα καί δεκα, καταντᾶν εἰς τὴν νῆσοι, ἐν οἰς καὶ αἱ τῶν ἀστρων ἀποκαταστάσεις ἐπὶ τέλος ἄγονται. καὶ διὰ τοῦτο τὸν ἐννέα καὶ δεκα ετῆ χρόνον ὑπό τῶν Ἑλλήνων μέγαν ἐνιαυτὸν ὀνομάζεσθαι. κατὰ δε τὴν ἐπιφάνειαν ταύτην τὸν θεὸν κιθαρίζειν τε καί χορεύειν συνεχῶς τὰς νύκτας ἀπὸ ἰσημερίας ἐαρινῆς ἕως πλειάδος ἀνατολῆς, ἐπὶ τοῖς ἰδίοις εὑημερήμασι τερπόμενον, βασιλεύειν τε τῆς πόλεως ταύτης; καὶ τοῦ τεμένους ἐπάρχειν τοὺς ὀνομαζομένους Βορεάδας, ἀπογόνυς ὄντας βορέυ, καὶ κατὰ γένος ἀεὶ διαδέχεσθαι τὰς ἀρχάς.*

It might, perhaps, suffice to point out, that this author manifests his own scepticism of what he thus repeats; He speaks of the things which he reports as fabulous "μυθολογουμενα;" as belonging to ancient fables "τας παλαιας μυθολογιας;" and these expressions, signifying the merely fabulous nature of the story, are repeated several times by him; nor does he once vouch for the relation, or indicate his belief of it.

The substance of his account, (for which he quotes Hecatæus, a historian who lived about 545 B. C.), is, that the Hyperboreans inhabited an island near the ocean, over against the Celtic country, and the Arctic or northern region; that they derived their name from their lying beyond the blast of Boreas; that their island was arable, and fertile in various products, its climate excellent, and yielding two gatherings of fruits in the year; that, as the birth-place of Latona, special worship was there paid to Apollo, beyond all other gods; and that the inhabitants were, in a manner, priests to that deity—singing daily hymns to him without ceasing; that they had a peculiar language;† and that they entertained a particular regard towards the Greeks, and especially towards the Athenians and Delians—a traditional goodwill handed down to them from ancient times; that some Greeks who had travelled among them, had left them splendid gifts inscribed with Grecian characters; that, in like manner, the

* Diod. Sic. Bibl. Hist. b. 2. c. 47.

† Bishop Heber considers Diodorus as having alleged, that the Hyperborean dialect approached to that of Delos, and as having positively pronounced on this point, and on their intercourse with the Delians; from this elegant and accomplished scholar, the writer of these observations can only differ with extreme diffidence; but it does appear to him, first—That Diodorus has not pronounced positively on any thing, but has merely related, with indications of unbelief, what he had heard or read; and, secondly—That he, Diodorus, distinctly speaks of the dialect of the Hyperboreans as peculiar (ἰδιαν), and of the connexion between them and the Greeks (especially the Athenians and Delians), as consisting, not in the language nor in intercourse, but in ancient traditionary regard, (*Pace tanti viri dixerim!*) It is probable, however, that he had before him the old Latin version above mentioned, which says "*Habent Hyperborei propriam linguam Græcis*"

visit of one Abaris, who, in ancient times, had passed into Greece, had kept up the national friendship and connexion with the Delians ;—that from this Hyperborean island the moon was seen at so short a distance from the earth, that the mountains, or projecting parts on her surface, seemed to be distinctly visible ; that the deity visited the island in cycles of nineteen years,—in which period, also, the revolutions of other planets were accomplished; and that, on that account, the nineteenth year was called by the Greeks, the "Great Year"* ; and that in this appearance, the deity played on the harp, and kept up nightly dances, from, the vernal Equinox to the rising of the Pleid ; and, finally, that the country was under the rule of the Boreadæ, the descendants of Boreas, in whom the hereditary dominion was vested.

From this incoherent and fabulous account, little, even of rational conjecture, still less of certainty, can be drawn ; it is evident, however, that Diodorus, or rather Hecatæus, assigns a very different position to the Hyperborean country, from that mentioned in Herodotus ; but his geographical statements are inconsistent with each other ;—for, whether we suppose the Celtic country to mean Gaul, as understood by some writers—and especially of late by Bishop Heber—or take his island of Hyperboreans to mean the Hebrides, as the Annotator on Bayle imagines,† we shall, in either case, be far from a country of so excellent a climate as to yield its fruits twice a year ; and we shall be equally at a loss to explain the astronomical facts which he states.

It may here be observed, however, that when the terms εν τοις αντιπεραν της Κελτικης τοποις,—and, κατα τας αρκτους are used by him respecting the Hyperborean Island, a much wider range is given in which to seek for that region, than would at first seem to be justified ; for the ancients appear to have had a very vague notion of the Celtic region ;‡ as while Herodotus (6 2, c. 33,) places the sources of the Ister, or Danube, among the Celts, *beyond the pillars of Herculus* ; we find from Plutarch, in his life of Marius, that the country of the Celts was considered to stretch from the Western Ocean to the

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* In the Greek (of Wesselings ed.), the word is μεγαν ; in the old Latin version the words are translated *Annum Metonum*, or the Metonic year.—The metonic cycle of the moon, which among the Greeks was 19 solar years, as stated in the text, was so called from Meton, an Athenian astronomer—(432 B. C.)

† Article ABARIS.

‡ In truth, Κελτικη was a term applied in early antiquity to all the north of Europe.

most northern climates, and to the lake Mœtis, eastward; while according to another account referred to by him, a Celtic tribe dwelt at the extremities of the earth, near the North Sea; and that they were then under that part of the heavens where the elevation of the pole was such, that by the declination of the parallels, it became almost a vertical point to the inhabitants, and their day and night divide the year into equal parts; on the other hand, the expression τας αρκτους is sometimes vaguely used for the northern hemisphere of the earth, or for distant points or places far to the northward of those regions, with which the ancient writers were most familiar.

But if we compare this account of Diodorus not only with its several parts, but with other passages of the same writer, we shall find still more remarkable inconsistencies;—for in his description of the Celts, the inhabitants of Galatia, (which was the name given by ancient geographers to Gaul in its whole extent), he calls them a nation *very much towards the Arctic pole*, dwelling in a frozen clime, where snow falls in winter instead of rain; where the earth and rivers are bound in ice, and where the severity of the climate is snch, that neither wine nor oil can be produced; and yet it is in the ocean over against this country and towards the pole that he or his author Hecatæus places the Hyperborean Island, with its delightful climate, fruitful soil, and two harvests in the year.

An examination of these and other passages in his work will be found to bear out the severe but just observations of Bishop Heber, (Hist. of the Cossacks, page 53), "that the knowledge "possessed by Diodorus of these countries (to the north and "east), is so greatly inferior to that of Herodotus, that it would "seem a strange kind of prejudice which should build on the "testimony of a remote and credulous antiquary, in preference "to that of one who had visited the countries, or conversed with "the people he describes; and that there are many proofs to be "found in Diodorus, that from the days of the father of history, "the knowledge of the north and east was retrograding among "the Greeks; and that the more widely succeeding authors de-"parted from his authority, the more effectually they betrayed "their own ignorance."

These observations may fitly be borne in mind in reviewing what has been written concerning the Hyperboreans by Pausanias, the next and only remaining prose author whom the writer of these notes has had the means of consulting *in extenso;* nor has he been able to meet with a copy in the original Greek; and his quotations are therefore made from the French translation of

Abbé Gedoyn, which, though pronounced by Larcher in his Annotations on Herodotus to be often incorrect, may be deemed sufficiently accurate for the purposes of the present reference.

Pausanias, who wrote 170 years after the Christian era, in giving a brief notice* of Prasiæ, a small town or district of Attica, mentions, that *there* was a temple of Apollo, to which it was said, that the Hyperboreans regularly sent offerings of their first-fruits, which they entrusted, in the first instance, to the Arimaspians,—and these to the Issedonians, from whom the Scythians received them and sent them to Sinope, (a Greek Milesian colony of Pontus in Asia) ; whence they were carried by the Greeks to Prasiæ ; and thence by the Athenians to Delos ;—and he adds, that these first-fruits were wrapped up in wheaten straw, and that none were allowed to see them.

It is obvious to remark, that this account seems, in its principal points, to be little more than a repetition of the current traditions of Delos, related by Herodotus,—with a considerable variation, however, in the line of route assigned to the Hyperborean offerings; they are still however represented as coming through the Scythian and Greek colonies to the Grecian continent, and thence to Delos ; but the first part of this passage from Pausanias, assigning these offerings a resting-place in the Prasian temple, is at variance with the conclusion which carries them to Delos.

In a subsequent passage, (book 5, cap. 7,) in treating of the Olympic games, he mentions the olive-crown, which was given as a prize ; and says, that the wild-olive was supposed to have been first brought into Greece by Hercules, from the country of the Hyperboreans,† a people that dwelt beyond the north-east wind ; that Olen the Lycian, in a hymn composed in honour of Achæia, first informed us, that that nymph came to Delos from the country of the Hyperboreans ; and that after Olen, Melanopus of Cumæ says in an ode in honour of Opis and Hecaerge,,‡ that they also came, in ancient times,§ *into Achæia* and to Delos ; and Pausanias adds, that Aristeas the Proconne-

* Book 1. c. 31.

† We translate here from the original Greek of this passage, which is found in one of Larcher's notes on Herodotus, as it appears from that commentator, that the text which the Abbé Gedoyn followed was incorrect, and his translation itself very inaccurate.

‡ These were the first female pilgrims mentioned by Herodotus as above, under the names of Opis and *Argé*, as having visited the Delian shrine.—Callimachus calls them, in his hymn to Delos (v. 292), Oupis and Loxo, and Hecaerge.

§ M. Larcher would here strike out the words ἐς Ἀχαΐαν, as a repetition, but there does not appear any necessity for this emendation.

sian, had satisfied himself with a very slight mention of the Hyperboreans, although he might have given a fuller account of them than other person, as he had travelled (according to his own statement in some verses he had written), into the Issedonian country.

Again, (in book 10, cap 5,) writing of Delphi, he mentions, that Bœo, a native of that neighbourhood, and well known for the hymns she had composed for the inhabitants of Delphi—had related that the temple there, in which Apollo in after times gave his oracles, was built by Hyperborean strangers; that several of them prophesied there; that she had made special mention of Olen as one of the prophetical bards, and as the inventor of hexameter verse; and that she had noticed also, by name, two other Hyperboreans who had come to that sacred spot; and he subsequently relates, as another tradition respecting that temple, that after the first rude chapel had been formed, a second was built by bees with wax, and théir own wings, and that this was sent* by Apollo to the Hyperboreans.

In these passages of Pausanias, we trace much of the same traditionary information which Herodotus had collected and handed down,—enlarged, indeed, but not improved by being mixed up with other traditions connected with Delphos instead of Delos; and with one addition, the inconsistency and improbability of which stamps the character of the whole,—that it was from this Hyperborean clime that the olive-tree was brought by Hercules into Greece: There is this defence, indeed, to be made for Pausanias, that (as Heyne observes in his notes on Pindar), he probably drew from *that* author his notion of the Hyperborean origin of the olive; but the Poet, inspired by his subject—"His eye in a fine phrenzy rolling o'er earth and heaven"—may be excused, or even praised, for a departure from the truth of geography, or of history, which we are not so well disposed to pardon in the historian: Turn we now, therefore, to this loftiest of Grecian poets, whom, in like manner, we shall find extolling Hercules for bringing the olive-tree from a far Hyperborean clime:—Pindar, (who, ac-

* There is probably some mistake here in the translation; as Mr. Bryant (a profound Grecian), translates the passage, that this same temple was *brought* by Apollo *from* the Hyperboreans; and he points out the singular mistake by which the agency of bees came to be introduced, the Greek word for *bees*, μελισσαις, signifying also certain *priestesses* of Cybele or Selene, and that the hive was used as a symbol of the ark, from which issued the swarm that was to re-people the earth. This emblem is found on ancient Græco, Scythian Medals, and others belonging to Greece and Asia, representing this Goddess.

cording to Heyne and Corsini, died about the time when Herodotus gave his history to the world), thus speaks of the olive in his third Olympic ode :—

—Γλαυκοχροα κοσμον ελαιας, ταν ποτε
Ιστρου απο σκιαρᾶν παγᾶν ἐνεῖκεν
Αμφιτρυωνιαδας
Μναμα των Ὀυλυμπιᾳ καλλιστον αθλων
* * * *
Δαμον Υπερβορεων πειταις Απολ—
λωνος θεραποντα

And afterwards :—

Δη τοτ' ες γαιαν πορευέν θυμος ὠρμαιν'
Ιστριαν νιν,— * * * *
Ιδε κἀκειναν χθονα
Πνοιᾶς οπιθεν Βορεα
Ψυχροῦ. τοθι δενδρεα θαυμαινε σταθεις,—κ. τ. λ.

In West's translation

———Bestows
The darksome olive,—studious to fulfil
The mighty founder's will,
Who this fair ensign of Olympic toil
From distant Scythia's fruitful soil,
And Hyperborean Ister's woody shore,
With fair entreaties gained to Grecian Elis bore.
* * * * * * * *
The spacious Scythian plains he viewed,—
A land beyond the chilling blast
And northern caves of Boreas cast;
There, too, the groves of olive he surveyed ;—&c.

Upon these passages,—which place the sources of the Danube and the native region of the olive, in a country beyond or behind the blast of Boreas, the Greek Scholiasts (both ancient and modern,) merely observe, that the Ister or Danube flows through many nations of Europe, but takes its rise in the country of the Hyperboreans,—and that Scythia was the country in which Hercules fonnd the olive ;—which, according to the Poet, he brought from the sources of the Ister, (Ιστρου απο σκιαρᾶν παγᾶν) (*) Herodotus, indeed, as has been remarked before, had but a very imperfect knowledge of the countries where the Danube rises, but he does not make it flow from north to south ; the Poet in

(*) Mr. Fawkes in one of his notes on the 4th book of the Argonautics of Apollonius Rhodius, has fallen into an error, in stating that Pindar in this Olympic ode, places the Hyperboreans in the island of the Blest: It will presently be seen that it is in another passage that he assigns them that locality.

his ardour, casts aside all geography,—and the grave Scholiast and Grammarian, writing many centuries later, follows his example;—the pithy observation of Heyne on the passage, contains all that can be said—*Locus notabilis propter veterum inscitiam geographiæ, et vagam Hyperboreorum notitiam: oleaster petitus esse non potuit nisi ex Australibus Europæ terris.*(†)

But after so long seeking the Hyperboreans beneath a polar sky, we are enabled by the same Poet, to whom we have just referred, to place them in a more genial clime: In his 10th Pythian ode he thus descants:

— ναυσι δ'ουτε πεζος ιων
Ε'υροις ἀν ἐς Υπερβορεων αγῶ—
—να θαυμαστον οδον.
Παρ' ὀις ποτε Περσευς
Εδαισατο λαγετας, δωματ' εσελθων,
Κλειτας ονων εκατομβας
Επιτοσσαις θεω
Ρεζοντας. ὠν θαλιαις εμπεδον
Ευφαμιαις δε μαλιστ' Απολλων
Χαιρει; * * * *
Μῶισα δ'ουκ αποδαμεῖ
Τροποις επι σφετεροισι, παν—
—τᾶ δε χοροι παρθενων
Λυρᾶν τε βοαι, καναχαι τ'αυλων δονεονται
Δαφνᾳ τε χρυσεᾳ κο—
—μας αναδησαντες ειλα—
—πινουσιν ευφρονως;
Νοσοι δ'ουτε γηρας ουλομενον
Κεκραται ιερᾶ γενεᾶ; πονων
Δε και μαχᾶν ατερ
Οικειοισι, φυγοντες

(†) We find also the Hyperboreans described as of the *Titanian* race, by one of the ancient Scholiasts on this passage, who quotes Pherenicus as his authority, in the following terms:

Αμφι θ'Υπερβορεων οἱ τ'εσχατα ναιεταουσι
Νηῶ υπ' Απολλωνος, απειρητοι πολεμοιο,
Τους μεν αρα προτερον εξ ἀιματος ὑμνειουσι
Τιτην ων βλαστοντας υπο δομον αιθρηεντα
Νασσαθαι Βορεαο γην (λαχειν) Αριμασπον ανακτα,—

But this quotation adds nothing to what more original authorities have told us, except in the particular of assigning this fabulous people a Titanian origin.

Υπερδικον Νεμεσιν ; θρασει —
—ᾳ δε πνεων καρδιᾳ
Μολεν Δανάας ποτε παις, ἀγεῖτο δ'Αθανα
Ες ανδρων μακαρων ὁ—
—μιλον. επεφνεν τε Γοργονα,—κ. τ. λ

Here we have at least a pleasing and poetical picture; the Hyperborean region is represented as enlivened by perpetual jollity, youth and joy,—justifying the comparison of Æschylus* Κρεισσονα χρυσου, μεγαλης δε τυχης, και Υπερβορεων μειζονα. (More precious than gold, and in bliss excelling that of the Hyperboreans,) and reminding us strongly of the daily and nightly hymns and dances with which Diodorus (drawing, perhaps, partly from this source,) represents the lunar cycle as celebrated in the Hyperborean island.

But let us examine, particularly, some of the parts of this striking passage; the story of Perseus is a well known part of Grecian Mythology; he is here spoken of as coming among the Hyperboreans, on his way to seek for the Gorgon virgins; he surprises the Hyperboreans in the sacrifice of asses to Apollo; but Herodotus tells us,(1) (and so it is to this day,) that, among the Scythians, there was neither ass nor mule, those animals being impatient of cold; Clemens Alexandrinus, indeed, speaks of the sacrificing of asses among the Scythians; but he relies on a verse of Callimachus,

Τερπουσιν λιπαραι Φοιβον ονοσφαγιαι
Apollo delights in the splendid sacrifices of Asses.

which the Scholiast on Pindar, (10th Pyth. line 49,) applies to the Hyperboreans; but the question still remains, who and where *they* were, if they ever existed; it may be inferred, however, that if those animals were not to be found among the Scythians, a nation farther north would not have them, and that this passage in Pindar, is not to be reconciled with the fact stated by Herodotus, but that another explanation is to be sought.

The errand of Perseus was to seek the Gorgon's head;—but as the Scholiast on Pindar remarks it is a question how Perseus could come among the Hyperboreans in this pursuit,—for *they* dwell towards the north pole, (this is the Scholiast's assumption,) but the Gorgons, according to some, were in the Erythræan and Ethiopian country, lying to the east and south, or (according to others) towards the farthest confines of Lybia, in the west, but (he adds,) that the Gorgons were *not* to be found towards the north pole, is plain, for no author has so related.

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* Choephori 365.
(1) Book 4, cap. 129.

There is a passage in Æschylus which illustrates the meaning of Pindar, and shews at least that the tragic Poet did not place the Gorgons among the Hyperboreans; in the *Prometheus Vinctus** he makes Prometheus describe thus, to Io, the course of her fated wanderings.

Οταν περασης ῥεῖθρον, ἠπειρων ὅρον,
προς ἀντολας φλογωπας ηλιοστιβεις
* * * * * * * *
ποντου περωσα φλοισβον, εστ' αν ἐξικῃ
προς Γοργονεια πεδια Κισθηνης
* * * * * * * *
πελας δ' αδελφαι τωνδε τρεις καταπτεροι,
δρακοντομαλλοι, Γοργονες βροτοστυγεις ; κ. τ. λ.

When thou shalt pass the flood—the common bound
Of either continent, direct thy steps
Right to the fiery portals of the East,—
The Sun's bright walk,—along the roaring beach,—
Till thou shalt come to the Gorgonian plains
Of Cisthene ;————
The Gorgons nigh,
Their sisters these, spread their broad wings, and wreath
Their horrid hair with serpents,—fiends abhorred,—
Whom never mortal could behold and live. (POTTER.)

thus fixing the abode of these amiable personages near Cisthene in Lycia: but Hesiod places them far in the west.

Γοργους θ', αἱ ναιουσι περην κλυτου Ωκεανοιο
Εσχατιῇ προς νυκτος ἰν Εσπεριδες λιγυφωνοι, † &c.

————————The Gorgons who remain
Far in the seat of night, the distant main,—
Where murmuring at their task, the Hesperides
Watch o'er the golden fruit, &c. (COOKE.)

And to that region, it is more reasonable to apply the description given by Pindar, in the passage under review, of the happy Hyperborean people visited by Perseus.

But there is yet another situation assigned to the Hyperboreans, by Posidonius, who places them among the Cottian Alps, now part of Switzerland and Italy; Ποσειδωνιος φησι τους Υπερβορεους οικεῖν περι τας Αλπεις τῆς Ιταλιας. (Schol. in Apollonium 2 v. 677.) And if we consider Herodotus as having had in view the Celtic country, afterwards known as Gaul, when he describes the Danube as taking its rise among the Celts, we shall find the Inn, one of the principal branches of the Danube, flowing from the country near the Cottian Alps; and the Celts of Herodotus and the Hyperboreans of Posidonius and Pindar may be nearly brought together.

The conclusion of the whole matter would seem to be this,

* (l. 809-813.)
† Hes. Theogonia, 375.

that from these passages and various other scattered allusions to the Hyperboreans in ancient writers, which will now be mentioned in a general way, it is certain that they were, down to a late period, in an utter state of ignorance and confusion upon the subject of geography and climate: Thule, which might be fancied by some to be the Hyperborean Island of Diodorus, and which is stated by Strabo as six days sail north of Britain, and by Dionysius in his Periegesis (v. 583,) as enjoying the light of the sun night and day, when he is farthest north, is praised by Solinus for its climate and fruitfulness in corn, in terms as strong as those which Diodorus applies to his Hyperborean island: Pliny speaks of the Hyperboreans (b.4.c.14) as said to live where the day was six months long,—as sowing their grain in the morning, reaping at noon, gathering their fruit at sunset, and hiding themselves at night in caves; and yet this author and Simonides, as quoted by the Abbé Barthelemi, describe them as enjoying perpetual spring, and youth, and health; their tranquil days gliding sweetly on though ten succeeding ages, in a round of festivals and joy; but, to use the words of D'Anville, it becomes us to number these among the supernatural wonders, that the ancients imputed to the Arctic climates.

Dionysius, who wrote his geographical Poem as late at least as the time of Domitian, places on the Baltic sea some of the Scythian nations mentioned by Herodotus as near the sources of the Borysthenes: while, of the Riphæan mountains mentioned by him, which Ptolemy places at the sources of the Tanais, and beyond which the Hyperboreans were supposed to live,—the very existence has been disproved in modern times.

And here, although out of the chronological order, we may close the whole proof in support of the conclusion we adopt, by resting on the authority of Strabo, supported by extracts from the coinciding opinions of other Greek authors from whom he derived in part his information, or who in part derived their's from him; But we would premise that according to the observation of M. Gosselin, (Mem. de l'Académie des Inscriptions, tom. 49, p. 724,) Strabo had apparently no knowledge of that part of Asia in which, following the accounts *reported* by Herodotus, we should be led to look for the Hyperborean country; and that he and all other ancient geographers were in fact ignorant, (however they might supply the place of science by conjecture,) of the countries now known as Tartarian Russia, Siberia, and the tracts eastward, to the ocean, and northward, to the arctic circle.

Strabo,* (as quoted in the 45th vol. of the Mem. de l'Acadé-

* Book XI.—The writer of this essay has not been able to find Strabo's work in any collection of Books within his reach.

mie des Inscriptions, p. 26,) states that all the nations beyond the Ister and the Euxine were included by the *ancient* Greek authors under the names of Hyperboreans, Arimaspians, and Sauromatians: and it would appear highly probable, from the perpetual changes going on among those barbarous tribes, by wars and migrations, that even the most well informed geographers must have been continually at fault in naming the occupants of any particular region; Then, the principle *omne ignotum pro magnifico*, had special power and application among the Greeks; Beyond the Sauromatians and Scythians, of whom, through their Colonies, they had some knowledge, lay unknown regions, which the genius of their poets, or their nation, peopled with the creations of fancy: Strabo however, writing at a period comparatively modern and enlightened, though he cannot wholly shake off the ancient errors, does not admit them into his entire belief: with respect to the supposed Hyperborean country he says (b.11) Υστατοι των γνωριμων Σκυθων Ροξολανοι ; ηδη δε τα επεκεινα δια ψυχος αοικητα εστι, and, "υπερ των Ροξολανεων, ει τινες οικουσιν, ουκ ισμεν. Again, Εν δε τοις βορειοτεροις - - - ἡ δε μεγιστη ημερα εστιν ὡρων δεκα ἑπτα : τα δ᾽ἐπεκεινα ηδη πλησιαζοντα τῃ αοικητω δια ψυχος.-- In this passage he seems to fix the limit at which the earth became uninhabitable by reason of cold at about 53° or 54° north latitude. Again in his first book he states generally Υπερβορεους τους βορειοτατους φασι λεγεσθαι. And in another passage (b. 7.) Δια δε την αγνοιαν των τοπων τουτων, οἱ τα Ριπαια και τους Υπερβορειους μυθοποιουντες, λογου ηξιωνται. In another passage he gives them indeed a more certain position, but still speaks only of what was *said*,—τους μεν απο του Ευξεινου και Ιστρυ και Αδριυ κατοικυντας Υπερβορευς ελεγον;—thus agreeing with the authorities already referred to, as to the vague manner in which the term was applied.

We conclude this part of the subject with some scattered citations to the same general effeet: Plutarch, in the life of Camillus, states that Heraclides of Pontus (B. C. 300) had related that it was an army of *Hyperboreans* who had taken Rome, when it was captured by the *Gauls*: A Greek Scholiast says, (in which he is supported by another on Apollonius,) Τον Ιστρον φησιν εκ των Υπερβορεων καταφερεσθαι, και των Ριπαιων. Another more modern Greek says Αλπεια ορη κατοικουντας παντας Υπερβορευς ονομαζεσθαι.

The Scholiast on Apollonius again states—Μνασεας δε φησι τους Υπερβορεους νυν Κελτους λεγεσθαι ; thus connecting the name with all the nations, from Spain to the farthest point east, known to the ancients, north of the Euxine ; And finally, Ptolemy himself

says,—Εν μεν τοις προς τηαγνωστω γη κλιμασιν, οι Υπερβορεοι Σαρμαται.

Upon a view of the whole question respecting the Hyperboreans, considered as a separate and distinct nation, (notwithstanding the weight of Sir W. Jones' opinion,--given however, incidentally, and as a mere *obiter dictum*,) we may be warranted in adopting the sentiments of Mr. Larcher in his Commentary on Herodotus, that as the Greeks applied the term *Boreans* to the Thracians, it is highly probable, that they called all those who lived beyond, *Hyperboreans*,—an opinion confirmed both by Constantine Porphyrogenites, who says that there are many considerable nations extending as far as the Danube in the country of the Hyperboreans, and by the authority of Posidonius, Strabo and the Greek Scholiasts already quoted,—and that in fact the Greeks understood by this word, the most distant nations towards the north, and applied it sometimes to one nation, sometimes to another.

But there is another view of the question, which we have reserved for the conclusion of this paper; Although the existence of a separate and distinct Hyperborean people cannot be proved from the Greek authors, it is not to be doubted that those northern parts of the earth,—unexplored, or unknown to them,—in which they supposed this fabulous nation to dwell, were inhabited by various tribes from a very early period: *There* dwelt the Celts, the descendants of Gomer and Japhet; thence, as has been supposed by very learned men, the Pelasgic Greeks themselves derived their origin; and in regions north and east of the Euxine, were reared up those hordes, which in later ages overwhelmed and overran Rome, and Greece, and all Europe.

From those early tribes it may naturally be supposed that some wandering pilgrims would occasionally find their way to the more genial regions of the south: may we not consider Abaris and Olen,—spoken of in several of the authorities already referred to,—as wanderers of this description?—for, although the latter is called by some a Lycian,—by Pausanias he is mentioned as a Hyperborean; and he may at any rate have come from a residence among the remote nations of the north into Greece.

Herodotus indeed has passed over the story of Abaris, as not deserving of particular notice or belief; but the manifestly fabulous part of the story may have led him too far to reject the whole,—if such rejection be indeed inferrible from the expressions he uses; the tradition, however, of the journey of Abaris into Greece is found in so many authors, that *this fact* at least, not impossible in itself, is deserving of belief. Further particulars respecting him, are given by Suidas (who wrote his Lexicon in the 11th century,) in the following passage:—

Αβαρις Σκυθης συνεγραψατο δε χρησμους τους καλουμενους Σκυθικους; και γαμον Ἑβρου του ποταμου, κ. τ. λ.—και Απολλωνος αφιξιν εις Υπερβορεους, εμμετρως.—Ἠκε δε εκ Σκυθων ες Ελλαδα. Τουτου ὁ μυθολογουμενος ὁιστος του πετομενου απο της Ελλαδος μεχρι των Υπερβορεων Σκυθων: εδοθη δε αυτῳ παρα του Απολλωνος * * * Φασι δε, οτι λοιμου κατα πασαν την οικουμενην γεγονοτος, ανειλεν ὁ Απολλων μαντευομενοις Ελλησι τε και βαρβαροις, των Αθηναιων δημον υπερ παντων ευχας ποιησασθαι: Πρεσβευομενων δε πολλων εθνων προς αυτους, και Αβαριν εξ Υπερβορεων πρεσβευ την αφικεσ.θαι, κατα την τριτην Ολυμπιαδα.

Those who are curious for further notices of this mysterious person will find all the information they can desire, collected from a variety of Greek authors, in the Dictionary of M. Bayle, Article ABARIS.

The Annotator on that article, partly adopting the opinion that the Hebrides were the Hyperborean country of Diodorus, is disposed to consider Abaris as a Highland Scot; but though we too, would trace him to a far northern region we cannot adopt him as a Scotchman, notwithstanding the peculiar gait and intellectual characteristics by which it is said that he was distinguished.(1) We take him for a Scythian, or a denizen of some of the remote regions north of the Euxine, of Thrace, or of Greece. He is represented as a Priest of Apollo; as having come(2) into Greece and to Delos;—as having uttered Oracles; and as having given himself out as a special worshipper of the Hyperborean Apollo,—one of the characters in which that heathen Deity was known to the Greeks.

Delos was in an especial manner the seat of the worship of both Apollo and Diana; to that island the female Scythian pilgrims, mentioned by Herodotus and by Callimachus, are said (as well as Abaris) to have come; *there*, were sung the hymns of Olen in honour of Apollo and Diana, supposed to have been composed in the ancient Dorian dialect, more than ten centuries

(1) The Annotator lays stress upon the similarity of the dress of Abaris (as reported by Hymerius the Sophist,) to that of the Highlanders, he having among other vestments, *trowsers down to his feet*; but we suspect that the Highlanders were not, by a great deal, so well covered, below, when the Annotator wrote, and if they were, the dress of Abaris was not different in this point from that of some other nations, as described in ancient authors; Ovid in one of his complaining poems from his exile at the mouth of the Danube, calls the neighbouring Getæ *braccati*; Persius applies the same term to the Medes; and the same word is used by Cæsar as a distinctive appellation of one district of the Gauls.

(2) According to the best chronology, not much more than 100 years before Herodotus wrote.

before the Christian Era; and which were also sung at the Apollinian temple at Delphos; The worship therefore of Apollo,—Delian, Delphian, and Hyperborean,—was an object of singular attraction to Greece in general, and also, particularly, to those remote visitants to Delos and Delphos: M. Larcher concludes, that the Scythians (or Hyperboreans so called,) were originally Greeks, because of their worship of Delian Apollo,—their rites,—and some similarities in their proper names; But in this question of origin, it seems as probable that Greece received her mythology in part from Scythia, as that Scythia derived the worship of the Delian Apollo from Greece: the proofs in support of this probability cannot be compressed within the compass of this Essay; (1) but we may simply enquire, (without dwelling on the name of *Scythiadis* given to the island of Delos, which is susceptible of another(2) explanation)—why should the pilgrimages from the Scythian or Hyperborean region (be they fabulous or otherwise) have been so handed down by constant tradition as connected with the Delian wordship?—why should the pilgrims, whenead, receive at Delos almost divine honours?—why should the Heathen Divinity himself have received the special distinction of Hyperborean? why should the people so called, be distinguished also as a sacred nation, specially devoted to that Deity? why should the other traditions connected with them be so constantly preserved,—if this northern worship of Apollo was only derived to them from the Greeks themselves: But the question may be solved if we suppose,—either, that the Delian worship of Apollo and Diana (or of the Sun and Moon, or fire and light,) anciently came from Scythia; or that this worship among the two nations, came from one and the same ancient and original source, but that the northern tribe had preserved it in greater purity.(3)

Abaris then may be supposed to have appeared in Greece as the sacred Ambassador andrepresentative, or Θεωρος, of the worshippers of Apollo,—the Sun or fire,—in the regions farther norththan Scythia or Thrace; He probably brought with him the bow and arrow, which were the peculiar emblems of those nations—still found (see Dr. Guthrie's appendix,) on many of the ancient Græco—Scythian coins; We know from Herodotus, that the worship of fire was pre-eminent among the Scythian nations; and in the Scythian name—"*Tabiti*,"—of their Deity of fire, mentioned by him, we may, without any forced etymol-

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1 See Bryant's ancient Mythology, vol. 1, throughout.

2 See Bishop Heber's history of the Cossacks.

3 It is admitted that the Cadmians, who are also called Phœnicians or Canaanites, brought the fire worship into Greece.

ogy, discover the *Cabiri*,—whose worship, embracing the Phænomena of the heavens and the various powers of earth and air, and derived from the Phœnicians, the Chaldees, and the idolatrous Hebrews, was spread over Africa, and the East, and was found among the Greeks of Samothrace in close neighbourhood to Scythia.*

That the worship of fire, or the Sun, came into the regions north of the Euxine, in the very earliest periods of history, there can be little doubt; it was among the most ancient, and, we may add, the most natural, of the forms of Idolatry:—when man, forsaking the pure service of the true God, turned himself to worship "the creature rather than the Creator," what more natural than that he should first adore the visible source of heat and light:—Looking upward to the glories of an eastern sky,

> "He saw the Sun whose chariot rolled
> On wheels of amber and of gold,"†

and, addressing him, perhaps, in such language as Milton puts into the mouth of the fallen Spirit,

> Oh thou that with surpassing glory crowned,
> Look'st from thy sole dominion like the God
> Of this new world,————

he worshipped him, less at first as the original cause of his life and happiness, than as the great *eye* of the material world, and emblem of its Divine author;—and, when the early races of men were scattered over the globe by the results of natural, moral, and political causes, and the northern regions became peopled by some of those tribes to whom this worship was familiar, and who are known to have made their way through Asia, and between and beyond the Euxine and Caspian Seas,—what more natural than, that in that Hyperborean region, the Sun should continue to be worshipped,—and especially with offerings of the first fruits of the earth, as the source of life, and light, of vegetation, and comfort; and the Moon—as in part his substitute and representative; and this will be found to have been the case among the northern, Scythian, or Celtic people, at a period anterior to Grecian mythology;—which, in fact, as Herodotus states, was only reduced to a system and nomenclature by Hesiod and Homer.

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* The Cabiri were fabled to be the sons of Hephaistus, or Helios, or the Sun, and their worship was carried from Egypt to Canaan

† Bishop Heber's hymn.

The Delian traditions, accordingly, as we have seen, represent the Hyperboreans as especially addicted to the worship of Apollo and Diana; Herodotus confirms the fact, as to the fire—worship of the Scythians;—he describes them, indeed, as also worshipping Jupiter and Neptune and Hercules; and we have seen that Pindar leads the latter hero among the Hyperboreans; but it has been shewn by Mr. Bryant that Jupiter and Neptune and Hercules were, in the worship of some heathen nations, identical with Apollo, and *he* again identical with the Canaanitish Baal,---with the Ammon of Lybia,--with the Apis of Egypt,--with the Arabian Saturn or *time*,—with the Zeus, Θεος, or Thoth of Assyria,—with the Egyptian Serapis,—and with Mithras or Osiris; that he was also the Bacchus of Thrace, and the Ηέλιος or Sun of Babylonish worship,—in short, that he was, according to the Orphic verses Εἷς Θεος ἐν παντεσσι*

We moreover know that Diana or the Moon, known also as Cybele, Dione, Selene, Astarte, and Meen, was especially worshipped, at an ancient date, among the Celtic nations north of the Euxine;—that she, who was the Isis of Egyptian worship, was also the Celtic Isis, (1) known as such from the Sarmatian region to Britain and to Gaul,—in which latter country she was the tutelar Deity of the Parisians, while yet Pagans;(2) and the Idol consecrated to her, was still subsisting in good condition in the Abbey of St. Germain des Près, until its removal, little more than three centuries ago.(3)

We will touch only on one more of the resemblances of the northern Celtic or Hyperborean fables, to the Mythology of Greece; Herodotus mentions the Arimaspians, or one eyed nation, as the neighbours of the Hyperboreans; Aristeas, to whom he refers, describes them (somewhat whimsically, as to one of

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* So also Nonnus Panopolitanus, himself an Egyptian, and versed in all the learning of the Egyptians and the Grecians, addresses Hercules—

Αστροχιτων Ἡρακλες, Αναξ πυρος, —Ορχαμε κοσμου

* * * * * * *

Βηλος επ' Ἐυφρηταο, Λιβυς κεκλημενος Αμμων,
Απις εφυς Νειλῳος, Αραψ Κρονος, Ασσυριος Ζευς,
Ει Χρονος, ει Φαεθων πολυωνυμος, ειτε ὁυ Μιθρης,
Ἡελιος Βαβυλωνος, εν Ελλαδι Δελφος Απολλων

upon which we may say with a learned modern, quoted by Mr. Bryant Neque enim tanta πολυθεοτης gentium,—quanta fuit Deorum πολυωνυμια.

(1) Pars Suevorum et Isidi Sacrificat. Tacitus de mor: Germ. c. 9.

2 From this worship of Sun and Moon among the Celts we derive the names of two days of our week.

3 Motteux on Rabelais.

his epithets,) as Οφθαλμον δ'ἐν εκαστος εχων χαριεντι μετωπῳ (each having one eye in his *graceful* forehead:) if, as is supposed, the Celtae were the descendants of Celtus, the son of Polyphemus of Grecian story, they are to be referred to Cyclopian original, (or the race of Anakims who were worshippers of the Sun:) and the Arimaspians, as surmised by Mr. Bryant, were probably Hyperborean Cyclopians, having the Egyptian symbol of an *eye* over the entrance of their temples, or otherwise prominently exhibited in their worship,—as the same symbol was seen over the temples of Osiris (the Grecian Apollo,) in Egypt,—a significant hieroglyphic, not merely of the Sun—ὁς παντ ἐφορᾶ και παντ ἐπακουει,—but of the superintendency of that Providence by which he was formed.

These brief notices of analogy, selected out of a multitude of others which we might adduce, if we could trust ourselves or venture to lead our readers further into this most tempting but boundless field of enquiry,—may suffice to establish at least *some degree* of probability, as to the origin of the Delian and Grecian traditions respecting the special honours paid by the Hyperboreans to Apollo,—the pilgrimages made by Abaris and others to the Delphian and Delian shrines of fire worship,—and the hymns of the Lycian or Hyperborean Olen to those powers of whose worship he had derived the knowledge and the rites from the East,—the fountain head, alike, of the whole race of mankind, and of all the false religions by which mankind have ever been debased,—as also of that only true one, on which,—spread by the goodness of Providence to this Hyperborean clime,—the Christian's sure and steadfast hopes repose.

ARTICLE XXII.—OBSERVATIONS ON THE HABITS OF THE SALMON FAMILY, BY W. HENRY, ESQR. SURGEON 66TH REGIMENT.

[Read April 15, 1837.]

The physical structure of fishes, so beautifully adapted to the nature of the element in which they live, has been the subject of especial notice and admiration amongst Naturalists and Philosophers, ancient and modern. The wedge-shaped head—the gradual and well proportioned enlargement of the body—the skilful machinery of the fins—the mailed and glossy skin—the ballasting air-bladder, and the rudder-tail, evince the wisdom, as the magnitude of the Leviathans of the Ocean show the power, of their Creator. But the use of the delicate painting with which the skins of many fishes are so richly adorned is not so apparent; and on a superficial view, it would almost seem to be a waste of bright colours lavished amidst the dim twilight of the deep. Yet we may be well assured from all analogy, that even this rich tinting of the mute tribes inhabiting the waters has not been bestowed on them without an object: and, farther even, that it may serve purposes of the greatest importance in the economy of nature.

The tiny lamp of the glow-worm and the fire-fly is delicately beautiful; but it is also believed to be of great value as a minute beacon, governing and directing the movements of the male insect towards the female. Thus it is not improbable that the gorgeousness of the skins of many fishes is a point of attraction between the genders, keeping up the gregariousness of the different families amidst the vast aqueous spaces they traverse. However this may be, the painted skin of the fish, considered merely as ornamental, harmonizes with the rich fur of the quadruped, the brilliant plumage of the bird, the umbrageous foliage and blossoming glory of the tree; and, above all, the exquisite adornment of the flower. All should be viewed as boons from the great source of measureless beneficence. We can conceive that a dull monotonous uniformity of shape, and sombre, melancholy colours, might have characterized the animal and vegetable kingdoms; but it has pleased the Deity to fill the heavens and the earth, and even the waters under the earth with beauty, and to confer on his rational creature, man, the capacity to comprehend and enjoy it.

Conspicuous amongst the finny tribes, as well for the quality of the delicious flesh, as for great elegance of colouring and symmetry of form, are the *Salmonidæ* or Salmon-family: but principally, according to my conception, is the *Salmo Salar*, or common Salmon, which has been appropriately placed by Cuvier at their head. In fact, we can scarcely conceive anything more perfect than the *tout ensemble* of this noble fish. He is moulded in accordance with our notions of great muscular strength, combined with remarkable lightness of outline; and every quality of the animal corresponds with his appearance. His tunic of rich silver tissue is in the chastest taste; his movements in his own element are peculiarly easy and graceful: he is fastidious in his food, as a fish of such high blood ought to be; but he can on emergency bear hunger well, and even total abstinence for a long period without injury. His spirit is ardent, adventurous, and persevering, and his speed is great.

It has been my fortune to be conversant with the habits of the Salmon from early youth, in a river in the north of Ireland, on the banks of which I was born. This association has been extended in after life to many other Salmon rivers, in different parts of the world, where I have enjoyed the pleasures of "the angle." I am enabled, therefore, from personal observation, to communicate some particulars respecting the natural history of the fish, which, probably, are not generally known, and may be, to a certain extent, interesting to the members of our Society.

The *Salmo Salar* is placed by Cuvier at the head of the fourth family of the *Malacopterygii*, or soft-finned fishes. In a paper of this light and desultory nature, it does not appear necessary to describe its generic characteristics more minutely. It is an inhabitant of cold, or temperate climates, to the north of the Equator; having never been found in the south. Indeed, such is the dislike of this fish for a warm climate, that it is very rarely seen in Europe southward of the 45th or 46th degree of latitude, but it abounds in the northern waters of the old world as it does in the new. Salmon run from the Pacific up the Columbia river, as from the Atlantic into the St. Lawrence. The rivers of the Polar regions swarm with Salmon during the short summer, and they are caught there in prodigious numbers. Commander Ross obtained a ton weight of the fish from the Esquimaux in exchange for a Sailor's knife, value about six-pence; and his men afterwards took 3300 Salmon at a single haul of the seine.

The rivers of Newfoundland and the Labrador coast contain abundance of these fish, which are also caught, but in diminishing numbers, in the streams of Nova-Scotia and New-Brunswick. They are found in the Kennebec and Connecticut rivers, and a

stray fish may be sometimes taken in the Hudson and the Delaware; but this is a rare occurrence. Salmon never ascend the Mississippi.

Norway is said to be the finest salmon country in the world. These fish go up the Rhine as far as the falls of Schaffhausen, which they cannot surmount. They are found in the Loire, but I believe, do not frequent any rivers farther south. In Gascony I have fished numerous streams, the tributaries of the Garonne and Adour, adapted as they would appear to be, to the taste of the fish for cool waters, by the melting of the Pyrenæan snow, but never met with, or heard of, the *Salmo Salar*; and very seldom found any trout, the smaller members of the family. I have also fished with much care several of the Spanish and Portuguese rivers, but never found a salmon or trout in any of them.

No salmon are to be met with in the Mediterranean, nor any of its rivers. They are also strangers to the Caspian and Black Seas; though a large coarse fish, bearing some resemblance to the *Salmo Salar*, called the *Hucho*, is found in the Danube.

Most intelligent persons are aware that the salmon is a great and intrepid traveller, migrating annually from the sea to the fresh water, and ascending the largest rivers to their distant sources. Influenced by unerring instinct, it quits the deep sea in spring or early summer, and repairs to the estuary of its native stream. It remains some days in the brackish water; probably to prepare the gills for the great change in the fluid they will have to breathe. At the mouths of small rivers the fish generally wait for a flood; moving up and down with the tide until the stream swells. The salmon then boldly pushes on, dashing through rapids, and even overleaping dams or other impediments in its way. After the first rush from the salt water, it avails itself of the convenient resting place of a deep pool, or other spot where the current is gentle, to draw breath for some hours, or even a day, if the stream is strong and rapid. It there recovers its wind, and recruits its strength with a fly or a grasshopper as they float down the river. The fish thus gradually approach the upper and shallower parts of the streams they frequent; journeying by day when the weather is cloudy, or the water sufficiently muddy to mask their movements; but when the river is clear they travel by night—particularly if there is a moon; otherwise very early in the morning. They seldom move, I believe, in the evening; but then, when flies are most numerous, look out for food. At length the salmon reaches his destination high up the stream, where he may look out for a mate, and take measures for the important business of propagating his kind.

When a strong rapid, or even a fall of a few feet, occurs in the course of our adventurous traveller's voyage, the obstacle is surmounted without much difficulty. But when the stream is deep and full and the fall considerable, the impediment becomes a serious matter, and the poor fish stops and is sadly puzzled how to overcome it. He soon begins to reconnoitre his position, exploring in all directions for a passage, and leaping frequently several feet out of the water, apparently with the object of discovering the topography of the scene of his difficulties from this elevation. When he finds the obstacle insurmountable, he is obliged to wait till the river falls; or in the event of the place being within the range of the salt water, which sometimes happens, until a spring-tide comes to his assistance.

There are many salmon-leaps in Europe—particularly in the British Islands and in Norway. Two of the most remarkable are at Coleraine and Ballyshannon in the North of Ireland. With the latter of these I am very well acquainted.

The large and very beautiful Lake, Loch Erne, fifty miles long by ten or twelve broad, pours its waters into the Atlantic by a short and rapid river, which after an impetuous course from Belleek, and a last fall of fifteen or sixteen feet at Ballyshannon, meets the tide at the bottom of a perpendicular ledge of limestone rock. *En passant* I may remark that Sir Humphrey Davy in his "Salmonia" praises the Erne as the best salmon-river he ever fished; and I think very justly. The sea is only three miles distant from the fall; and in early summer innumerable salmon run up the river and assemble in "the pool," as the abyss below the rock is called, checked in their career by this formidable barrier. In the course of a week many thousands are here collected, waiting, as it would almost appear, for a spring-tide to raise the water in the pool and lower their leap. In the mean time they are taken in the seine in great numbers—sold on the spot, or shipped off, either pickled or in ice to London. In the year 1808 I saw six hundred salmon taken there in one haul: two of which, weighing fifty-four and fifty-six pounds, were afterwards exhibited as curiosities in the fish-house.

Men, however, are not here the only fishers. Seals follow the salmon from the sea and prey upon them in the pool, pursuing them with greater speed and success than the unwieldy appearance of these amphibious creatures would lead one to expect. But these daring poachers, who thus imprudently venture into the presence of the lords of the creation, are generally shot—very often in *flagrante delicto*, as they emerge from the froth at the bottom of the fall, with salmon writhing in their mouths.

The Ballyshannon salmon-leap is a scene of much curiosity and interest, particularly during spring-tides, when the weather is fine, and then attracts a great number of spectators. As the water rises the fish begin to leap—perhaps two or three hundred in an hour. The young salmon very generally miscalculate the direction they should take; leaping perpendicularly out of the water, and of course falling back immediately. But the older fish, many of which, no doubt, have been up before, and are besides better mathematicians, manage differently. These dart to the crest of the cataract in a line with the curve of the falling mass, and there cling for some seconds, wriggling themselves into the torrent. In this very difficult position they can only work on the water with the pectoral and ventral fins; the force of their powerful tail, by which they had sprung from the bottom, being now lost in beating the air. Many notwithstanding succeed, dip into the water at the top and shoot up the river: but the great majority—probably five-sixths of the number, fail, and after the most gallant struggle are tumbled back into the pool.

At some of the salmon-leaps in Scotland, men are accustomed to catch the fish in a large landing net, with a long handle, as they fall back after missing the leap. In Kilmarnock they tell a story of the eccentric, and somewhat savage Lord Lovat, who was beheaded on Tower-hill, which is characteristic of that Nobleman's peculiar disposition. He was wont to have a fire kindled in a cleft of the rock close to a salmon-leap in a stream of that neighbourhood. When it was approaching his dinner hour, he would direct a pot of water to be placed on the fire to boil, in the expectation that an unfortunate fish, after missing his leap, might tumble over the edge of the rock into the boiling water, and thus commit self-salmocide. The tradition is, that his Lordship often succeeded in this quaint but cruel experiment.

After the great effort of surmounting a considerable fall, the successful fish rest during several hours in the first gentle current they meet, before proceeding farther on their journey. Some Naturalists have estimated the first day's voyage of a salmon, after entering the fresh water, at fifteen or twenty miles; but it is evident that the distance cannot be calculated accurately, and must vary according to the nature of the stream. If the river is rapid and obstructed by falls, the fish's stages must be short; and vice versa.

It appears to be necessary for the salmon to remain from two to three months in the rivers for the due developement of the generative system, before pairing and the deposition of the spawn can be effected. In the mean time the quality of the ani-

mal's flesh deteriorates—the skin, which is a correct index of the condition of the fish, changes from a silvery white to a tinge of reddish brown, and then to a dirty black brown. The firmness of the muscles softens; the curd between their layers disappears, and the cutaneous fat is absorbed. As the excitement of the sexual passion increases, the appetite for food ceases, and the salmon emaciates daily. At length the flesh loses all its nutritive qualities as human food, and becomes to a certain extent poisonous.

The food of salmon in the sea, whatever it is, is eminently nutritive. The subject is still involved in obscurity, though some clever Naturalists have lately paid much attention to it. Dr. Knox, who has written a scientific and able paper on the Natural History of the fish, which was published in the transactions of the Royal Society of Edinburgh for 1834, believes that he has discovered the secret. He avers that salmon in the salt water feed principally, if not wholly, on the eggs of the *Asterias Glacialis*, or cross-fish, one of the *Entomostraca*, or testaceous insects. Now, from the animal's teeth, one might think he lived on more substantial food than almost microscopic ova. But there is positive evidence that cannot be doubted, of sand-eels and small fish being eaten in the sea by salmon. Sir Wm. Jardine,* who made an excursion to Sutherlandshire in 1834, for the purpose of examining the natural productions of the country, and paid particular attention to the habits of the salmon, states that they are often taken on the Sutherland shores at the haddock lines, *baited with sand-eels*, and in the Durness Firth with lines set on purpose with the same bait. And what is quite conclusive on the subject, my friend Dr. Kelly, of the Royal Navy, informs me that in the summer of 1835, when accompanying Capt. Bayfield, R. N., in surveying the Gulf, he saw some salmon, recently caught, opened by the fishermen at Gaspé, and *observed three sand-eels and two smelts in the stomach of one of them.* Dr. Kelly adds that the fishermen told him this was a common occurrence.

After entering the fresh water, it has been a question whether salmon eat any food at all; as the stomachs of many individuals have been opened at different times, by various persons, and nothing could be discovered in them.

According to my experience, the case stands thus. When they first ascend the rivers they will eat greedily enough—jump at flies of every description without hesitation—devour worms, grass-hoppers, and even small fish. In the Lakes of Killarney

* Fourth Report of the British Association, page 613.

they are caught under these circumstances by trolling with both natural and artificial minnow. At this period, as every salmon fisher knows, they will rise at his fly with eagerness. I have myself found, in at least a dozen instances, the larva of insects, remains of earth-worms, grass-hoppers and various kinds of flies, in the stomachs of salmon caught soon after quitting the sea. But, after a month or six weeks' residence in the rivers, when the sexual propensities and organs begin to receive their developement, the fish cease to eat, and then appear to be able to live for several weeks without any food whatever.

Even before this time, and when they first run up the rivers, salmon are capable of bearing a long fast without injury. At Dayrée's bridge on the Jacques Cartier river, nine leagues above Quebec, there is a tank, or reservoir, fed by a copious spring gushing out of the bank of the picturesque dell through which that fine stream runs. In this receptacle the fish which are not injured in being caught, are sometimes kept three weeks or a month, until a sufficient number are collected to be sent to the Quebec market. Under these circumstances, they continue in good health, and do not appear to lose flesh.

There is a ford on the river Esk, about a mile to the eastward of the town of Donegal in the north of Ireland, which in my young days was a favorite resort of salmon in the breeding season. The lower part of this ford, just above the commencement of a small rapid, was generally the chosen spot. Here the bottom consisted of loose gravel, the stream flowed gently, and, in ordinary states of the river, the water was about twelve or fourteen inches deep. Concealed in a thicket at the root of some willows on the bank, I have at this place, on more than twenty occasions, witnessed for hours the interesting manœuvres of the fish.

With admirable instinct these creatures never select a stream that is likely to dry up. It is essential, I believe, that the bed or nest of the ova should be at the bottom of running water of moderate depth,—not in too strong a current, which, during floods, would be likely to carry off and destroy the deposite ;—nor in a stagnant part of the river, where a mud sediment and the want of water sufficiently ærated might choke the embryo brood.

When the place is chosen, both fish set to work, to scoop out a proper hollow for the spawn. On every occasion I observed that the female commenced the operation, as she had in all probability selected the site of the bed. She is easily distinguished from the male by her large and matronly size, as he is conspicuous by the curious hooked appendage projecting upwards from the centre of the lower jaw. The female then, in curious ana-

logy with the hen-bird, begins to make her nest, by digging into the gravel with her belly and tail, sometimes poking a refractory pebble out of the way with her nose. The male fish all the time keeps watch in the immediate neighborhood of his wife; and although nature has denied him the power of serenading her with a song, after the fashion of the cock-bird, our gallant salmon does not the less tenderly guard the privacy of his spouse, but swims round her in a protecting circle, to prevent interlopers from disturbing her in her interesting employment. When the lady-fish has worked long enough, which may be from a quarter to half an hour, she rests for a little, and the attentive husband takes her place immediately and commences digging.—She then circles round and watches over him in her turn. Indeed, there is much moral interest excited by these proceedings; and I may venture to add, that the reciprocal punctuality and affection with which this labour of parental providence is carried on by the silent pair, are worthy of all imitation by more exalted husbands and wives.

Soon after the bed for the ova is finished, which is a trench five or six feet long, and about a foot and a half in breadth and depth, both fish remain for a short time in close dalliance immediately above it. The roe is then deposited by the female, and the fecundating milt shed over the eggs by the male. They then simultaneously commence pushing the gravel they had previously raised over the precious deposit; and generally continue thus occupied during the remainder of the day, filling up interstices and completing the work at their leisure. I believe they then retire, appearing to have done all that parental duty requires; and although I have watched carefully several times at the same spot, I have never seen either fish in the neighborhood the day after the spawning.

European salmon generally spawn in October or November, and the ova remain in their bed of gravel about 140 days. The increasing heat of March and April then vivifies the brood, and the young tad-pole fish work their way by degrees out of the nest, with the filmy envelope of the egg, like an umbilical cord, still adhering to the belly. They grow with great rapidity, eat with voracity, and will jump at a dragon-fly as big as one of themselves. In the latter end of April and the beginning of May, they gradually drop down the rivers, keeping in the shallow water near the edge, both to pick up their food and to avoid the attacks of pikes or other ravenous fish. By the end of the first week in June, they are all clear of the fresh water, under ordinary circumstances.

These little fishes are extremely delicate, and will not bear

rough handling. They are incessantly rising at an angler's flies, and I have caught some thousands of them and thrown them in again. If the hook has only a slight hold of the mouth, and is taken out with care and gentleness, they will swim away briskly, quite uninjured; but if the barb goes deep, or any roughness is used, they are destroyed. An accidental fall on the ground from a height of a foot or two, kills them immediately. Various attempts have been made to transport them to fish-ponds from their native streams, but, I believe, with uniform want of success. I have several times made the experiment of removing smelts, as the fry are called, in a bucket of water, to a fish-pond adjoining the river, but fed from a different source.—None of them lived two hours.

Under these circumstances, it is probable that the most of the stories we have been told of these delicate fry having been caught and marked, and afterwards discovered in the course of the same summer, grilses, or young salmon, four or five pounds weight, are fictions; though there can be little doubt of their growth in the sea being extremely rapid. In all probability the fry which enter the salt water in the beginning of June, return in September, or even earlier, small salmon. Shaw, in his Zoology, states that M. de la Lande fastened small rings of copper to the tails of different individuals, and found that they returned during three successive seasons. I have never been able to ascertain this fact from my own experience, though I have caught some dozens of fry, marked and liberated them, but in no instance had the good fortune to meet with any of my little captives afterwards.

The condition of the parent fish, after spawning, is very deplorable. They become so weak and thin that they can scarcely stem the current of the river, and then usually seek the repose of some deep hole where they may remain quiet, and to a certain extent, recover their strength. But they continue languid and torpid during the winter, in a condition little better than that of the hybernating animals. From the great emaciation of the body, the head appears disproportionately large, and looks as if it belonged to another fish. The flesh is white, or of a dirty yellow; tasteless and unhealthy. When hooked by the angler under these circumstances, they are quite passive and helpless, and suffer themselves to be dragged almost unresistingly to the shore. In early spring they fall down the rivers, and, like other valetudinarians, repair to the sea for the recovery of their health.

From the peculiar structure of their single heart the circulation of the blood in most fishes is weak aud venous, and without

the arterial vigour of terrestrial animals. Under certain circumstances, salmon will permit their body to be felt all over with the hand, and even appear to derive some gratification from gentle friction. I have repeatedly endeavoured to ascertain if there was any beating of the heart or pulse in any part of the body, but never could discover the least pulsation any where. Authorities state, notwithstanding, that the heart of a large carp beats 36 times in a minute. The salmon, being a larger fish, has probably a slower circulation, if we may judge from analogy with respect to the mammalia. Man's heart contracts 72 times in a minute—a horse's 36, and an elephant's (as I have myself ascertained) only 24 times. The respiration of fishes is, I believe, quicker than is generally supposed. From a mean of many observations made on seven salmon of different sizes, in a reservoir fed by a copious stream, I found that they breathe 54 times in a minute. Man's respiration is 20.

There is a peculiarity in the instincts of salmon worthy of notice, viz.; their almost invariable habit of returning from unknown distances and depths of ocean to the streams where they were bred. They may be forced by stress of weather, or the pursuit of some of their natural enemies, into the mouth of a strange river—like a ship driven by a storm into a hostile port —but the vast majority find their way back to their native waters. In the north of Ireland, and I believe all round the coast, the fishermen will immediately point out a stray fish. For, although the *Salmo Salar* is the same as to generic characteristics in every part of the British Islands, still there are minute variations of shape and colour between the fish of different rivers, only recognizable by the keen eye of an experienced fisherman.

Some recent experiments on one of the Duke of Sutherland's Scotch estates, if the accounts in the newspapers are correct, would appear to confirm the general belief as to this local instinct. It is stated, that in two branches of the Tay, no salmon had ever been found, although these streams appeared sufficiently favourable for their habits and propagation. In 1835, the Duke's agent placed a pair of breeding fish in each stream. The rivers were carefully watched and preserved—they bred; and, true to their instinct, the young fish in 1836 ascended those waters where a salmon had never been seen before.

Like travellers on bad roads, these fish undergo great fatigues, and often suffer serious injuries in forcing their way up a powerful and rapid stream. They are driven by the current against sharp and unseen rocks, and bruised and wounded more than

would be considered probable. The snout, with which they feel their way when the water is muddy, is, under these circumstances, always excoriated, and generally rubbed white. The fins too, particularly the pectoral fins, and even the tail, are often found split; the fine, but strong membrane that binds the rays, having been torn by the violent efforts their toilsome journey renders necessary. We have opportunities of seeing this every summer at Dayrée's bridge on the Jacques Cartier River, where almost every salmon in the reservoir is thus wounded or disabled. Indeed the poor fish have extraordinary difficulties to encounter in that beautiful but most rapid stream.

I may here observe, that, although the distinguished epicures of ancient Rome explored every known region for dainties to furnish their luxurious boards, our noble fish never graced their banquets. Apicius might load his table with wild boar, the brains of swans and peacocks, and the tongues of larks and nightingales; or even introduce mullet, turbot, or Colchester oysters as a third course—but one exquisite dish was wanting—he had no salmon.

Mutability is the characteristic of every thing human; and often, even the transition from the most distant extremes of luxury and penury is observable in nations, as in individuals. In the same country where the proud lords of the world were wont to give suppers to tributary kings, in saloons dedicated to Jupiter or Venus, at an expense of 30 or £40,000, the Patrician now dines on a modicum of macaroni, value a few pence. Whilst the descendants of the painted British barbarians, so despised by the haughty Romans, give, at the present day, the most sumptuous entertainments in Rome; and some years ago were wont to feed even their domestic servants, in their own country, with a dainty fish of far superior flavour to any that ever appeared on the table of Lucullus or Augustus.

It is a fact, that about a hundred years ago, such was the abundance of salmon in the Severn, the Humber, the Tyne, and several other English and Welch rivers, domestic servants stipulated with their masters, when hiring, that they should not be fed on this food more than twice a-week. In Scotland and Ireland the same agreement continued to be made to a much later period, even in the memory of some old persons now living on the banks of the Tweed, but with reference chiefly to the salted fish. In those days they were unacquainted with the mode of preserving the fish in ice, or even pickling them; and they had no steamboats to convey them in a few hours to London.

It has been doubted whether the *Salmo Salar* of Europe, and

the salmon of the North American rivers, are identical. As far as I am capable of judging, they appear the same fish. The shape, colour, habits, conformation of the branchiæ, number and position of the fins and of their rays, form of the tail, and number of the vertebræ (61) are, I believe, generically the same. The flavour, too, of the American fish, caught unfatigued and fresh from the sea, under equal advantages of cookery and appetite, is not inferior to that of his European brother.

About the middle of May the salmon begin to run up the St. Lawrence; but not in any considerable numbers, till the middle of June. They coast along on both sides, on the look out for their respective rivers, I presume; but ascend along the northern shore for the greater part, where the tributary streams are clearer and more rapid, and pour in cooler water than those in the south. They advance, I believe, with each tide, gradually feeling their way, and running up the small rivers as floods or other favorable circumstances invite them. Great numbers are caught in the stake nets, or in wooden traps, with which both shores are now thickly studded. The smaller branches of the St. Lawrence absorb a large proportion. Many thousands, no doubt, ascend the Ottawa, to breed amidst its remote streams unmolested by man. Still, a large body push up the main river, all the way to Lake Ontario. Arrived there, they move towards the head of the lake, keeping close to both shores, but preferring still the northern or Canadian side, in all probability for the reason mentioned before. They are very rarely found at Kingston, but are often speared along the shores of the Bay of Quinté, and at the mouth of the rapid river Trent. They are caught in considerable numbers every year about Toronto, and in the streams that run into the north-western extremity of Lake Ontario, still in tolerable condition, notwithstanding the distance from the sea and the difficulties of the journey. The flesh is a little softer than that of our Quebec fish—the colour a fainter pink, and the flavour not quite so rich; but enough of its good qualities remains to make it far superior to any of the Ontario fish.

There is a large trout, or pseudo-salmon, in this magnificent lake, which is sometimes confounded, by inexperienced persons, with the *Salmo Salar*. It certainly resembles our favorite fish a little in shape and colour; but the head is coarse and clumsy, and the number of the vertebræ and figure of the tail are different. There is also a generic difference in the fins, and the flesh is destitute of the rich red colour and genuine salmon flavour. I have never heard of this fish having been caught out of the lake, and am of opinion, it does not visit the sea. It is probably identical with the *Salmo Eriox*, or Bull-Trout, found in

Loch Aw, in Argyleshire, and three or four other lakes in Scotland.

The abyss, at Niagara, is the *ne plus ultra* of most of the Ontario fish ; and innumerable sturgeon, bass, pickerel, pike, eels, white fish (a splendid corregonus,) cat-fish, chubb and mustheenongee, collect there every summer. Salmon, however, are not amongst the number, and, except a stray fish, very rarely now ever go up the Niagara River.

Some Naturalists have assigned fanciful reasons for this. It has been gravely asserted, that a tradition respecting the insuperable barrier of the Falls, has been transmitted from one generation of salmon to another—they, therefore, think it useless to ascend, or, what is equally improbable, the noise of the Cataract, fifteen miles distant, frightens them away.

The fact of the non-appearance of salmon, in the Niagara River, appears to be easily explained. That river is deep through its whole course, having no small branches, shallows, or shelving shores, adapted to the wants of the breeding fish. As salmon frequent only streams where they can prepare proper beds for the spawn, and this is impossible in the Niagara River—we do not find them there.

Individual fish do, however, occasionally make their way to the Falls. On one visit there, in 1833, I saw a salmon leap out of the water, in crossing at the ferry, and so near the boat, that I could scarcely be mistaken as to the fish. The fishermen, who sweep the fine beach on the Canadian side, at the mouth of the Niagara, with their nets, told me that they never take any salmon.

It is remarkable, that salmon will not rise at a fly, either natural or artificial, in salt water; nor is there any instance known, I believe, of their being caught there with any other bait. Swimming about in the brackish water of the estuaries of rivers, they will not touch the same fly at which they may rise greedily, perhaps, the next day, when they push up the fresh stream. The St. Lawrence fish will not take a fly in the tidewater of their own river, nor even in Lake Ontario.

Salmon, like many other animals, are subject to the attacks of parasitical enemies, which cling to their skin or infest their intestines. I have repeatedly caught fish fresh from the sea with the *monoculus piscinus* adhering to their skin. This insect drops off after a day or two's residence in the fresh water; but they often pick up another still more troublesome companion in the rivers—the *Lernæa Salmonea*, which clings to the gill, covers and often materially obstructs the breathing of the fish. They are freed from this annoyance as soon as they return to the sea. Tape worms are very often found in the stomach and intestines.

This fine fish is amongst the most cherished objects of the angler's pursuit; and successful salmon-fishing with the rod and line will, probably, always rank amongst the most exciting, absorbing, and delightful sports that mortals are permitted to enjoy.

A zealous angler may be allowed to eulogize his art even before a Literary Society, for his amusement is one of the handmaids of Science, and has already contributed not a little to increase the knowledge stored up in the department of Natural History. Besides, the nature of his sport is essentially quiet, contemplative and favorable to thought and reflection. "Because," as an old English writer expresses himself, "hawking and hunting are very laborious: much riding and many dangers accompany them; but this is still and quiet: and if so be that the angler catch no fish, yet hath he a wholesome walk to the brook-side, and pleasant shade by the sweet silver streams. He hath good aire and sweet smels of fine fresh meadow-flowers: he heareth the melodious harmony of birds—he sees the swans, herons, ducks, water-hens, cootes, and many other fowle with their brood; which he thinks better than the noise of hounds or blast of hornes, and all the sport that they can make." *

A salmon when first hooked by the angler, makes the most desperate efforts to escape. It darts away with prodigious velocity, spinning the reel merrily, and running out fifty, sixty, or even a hundred yards of line. It then leaps madly and repeatedly out of the water, shaking its head with great violence to get rid of the barbed torment within its jaws. Failing in this, it tries opposite tactics; descends to the bottom of the river, and there attempts to accomplish the same object by rubbing out the hook against the rocks. Next follows another course of some half-dozen or dozen leaps out of the water, requiring great care and tact on the part of the fisher to keep the line taught during these convulsive struggles. It is at this time that unskilful anglers generally lose their fish. If the salmon is unsuccessful in all these attempts to liberate himself, he very often, as a last effort, makes a rush down the stream.—Luckily for the fisher, but unfortunately for the poor fish, it is destitute of the instinct of the pike, which prompts that voracious creature to bite through the slender line to which he is a prisoner. The capture of a large and active fish weighing thirty pounds, has sometimes employed me more than two hours.

Trout are classed by Ichthyologists amongst the salmon family, and denominated the *Salmo Fario;* of which there are

* Anatomy of Melancholy.

perhaps a thousand varieties. A large proportion of these are found in Lower Canada; but the Canadian trout is much inferior in firmness and flavour to the same fish in Europe. Besides, it is often brought into market in very indifferent condition, and before it has had time to recover from the debilitating effects of the long winter; for when the ice disappears, all the fresh water fish here are in a state of great leanness and weakness from want of food. Trout in this country are in the best order about the end of July, when they have had time to fatten on the numerous insects with which the waters abound in summer, and before the season of pairing injures the flavour of their flesh. The Canadian trout are far less particular as to their food than their brethren in the old world. They are moreóver sluggish in their movements, make slight resistance when hooked by the angler, and afford but little amusement.

But there is an exception to this. A large, lively and beautiful salmon trout, called by Griffiths in his "Animal Kingdom" the *Salmo Canadensis*, is to be found in the lower branches of the St. Lawrence, on the North shore. This is unquestionably the most splendid trout I have ever seen, and is besides a fish of firm, pink flesh, and the finest flavour. It is voracious, strong and active, leaping out of the water like a salmon, and affording the fisher excellent sport. The dolphin's vaunted skin, (and I have seen and caught many) is far inferior to the superb colours of this fine trout; and the clustering and brilliant spots of red, yellow, blue, and gold on its rich coat, almost defy the pencil to represent them adequately. In the Malbay river, ninety miles below Quebec, I have frequently caught from two to three dozen of these literally glorious trout in a forenoon—many four and five pounds weight, but averaging about three. Last year I caught one enormous individual of the same kind, in the Jacques Cartier River, weighing seventeen pounds; but this fish was not in good condition, and had lost much of his beauty.

The *Salmo Salmulus* or Parr, is to be met with in some of the streams in this Province. I found a few last summer in the Jacques Cartier. This pretty little fish is often confounded with the salmon fry; but it is now ascertained to be a distinct species, never growing to more than six or eight inches in length.

The number of men and amount of capital employed in the Salmon Fisheries of Great Britain and Ireland are now so great, that they have become collectively an object of national importance only second to the Cod Fishery. The right of fishing certain rivers is leased for large sums. The fishery on the Erne at Ballyshannon, lets from £2500 to £3000 a-year, with a profit to the Lessee of from £1400 to £1600. Coleraine, I believe, is of nearly equal value. Many of the Scotch rivers also yield large rents; but the Fisheries of the Tweed far exceed in value any other British or Irish river, having been let only three years ago for £15,700 per annum. The produce of the salmon sent to London, was at the same time, estimated at £54,000, but the necessary expenses are very great. Seventy boats and three hundred fishermen are employed during the season at Berwick, on the English side of the river alone.

The consumption of salmon in London and the other large towns of the British Islands, as well as in the houses of the higher and wealthier classes in the country, has become of late years enormous, and the vast sums expended on this dear and luxurious article, could only be afforded by the immense wealth of England. To answer this great demand, new means of destruction were devised. Nets were made of such dimensions as to embrace the whole circle of the mouth of a salmon river, and the capture of the fish was highly stimulated every where, and undertaken in every way. One hundred thousand salmon per week, for several weeks in the summer, used to be exported from the Eastern Ports of Scotland alone—the greater part of which were sent to London.

But this over-stimulation of the fishery had the natural effect. The fish that layed such golden eggs ran the greatest risk of being herself destroyed, by the pernicious cupidity their great price excited; for the very existence of the race of salmon became seriously endangered in some of the most productive rivers. About ten years ago, great and general complaints were made by the river proprietors in Great Britain and Ireland, of an alarming diminution in the number of the fish: numerous petitions were presented to the Legislature, and in consequence, a Committee of the House of Commons was appointed to enquire into the matter. It sat three months—examined many witnesses, collected information from various quarters, and made an elaborate Report. The purport was, that the complaints respecting the great falling off in the productiveness of the salmon fisheries were well founded—that from the inefficacy of the laws against poaching the rivers, and its vast increase—the

more general employment of large nets at the mouths of salmon rivers, and the more numerous impediments of water machinery in their course, the fisheries were threatened with total destruction. They therefore recommended some more cogent legislative measures to prevent the approaching extinction of salmon in Great Britain.

A Bill founded on this Report, was brought into Parliament, and an Act passed in 1828. By this statute any fishing for salmon with nets, rods, or any other implements, between the 14th September and the 1st February, was made a misdemeanor punishable by a fine of from one to ten pounds, with forfeiture of fishing gear. Other protective provisions were also introduced, with additional penalties against poaching. It is stated on good authority, that this act has already had a very beneficial effect on the fisheries; though many well-informed persons think an additional month's "close time," as it is called, should have been enforced, and that no salmon fishing of any kind should be permitted until the 1st of March. Sir Humphrey Davy, a high authority on the subject, was of opinion that it should be forbidden until the 1st of May.

Some legislative protection for salmon, appears to be much required in the Canadas; for, although the number that run up this noble river is still great, there can be no doubt that it is sensibly diminishing. There are many causes operating to produce this effect. The salmon are killed at all times, in or out of season; and even the parent-fish, pregnant with some tens of thousands of ova, and absolutely half-poisonous as food, are wantonly destroyed. The very fulness of roe, and consequent large size of the fish, proving the flesh to be unwholesome, tends sometimes to raise their price in the market. Many of the salmon that are offered for sale in August, and I believe, all that are caught in the latter end of that month, and in September, are foul fish, unfit to be eaten.

The progressive settlement of the interior of the country is prejudicial to the salmon race in various ways. The stake nets and weirs or salmon traps, with which every promontory of both shores of the St. Lawrence is now armed, are more numerous and better arranged than formerly. As the population increases on the banks of the breeding streams in both Provinces, mills and dams are erected, and new impediments placed in the way of the fish; whilst the Canadian fishermen, and the Indians, their aboriginal enemies, become more skilful and successful every year. All this improvement is calculated to thin their numbers; and the increasing trade of the river, "furrowing its waters with a thousand keels"—or churning the

stream beneath the paddles of the numerous steam-boats, doubtless disturbs or frightens many of them away.

I assume then, as a matter of notoriety, that a serious diminution in the numbers of the St. Lawrence salmon has lately taken place; but for want of sufficient data, it is not easy to estimate its extent with any accuracy. My own impression is, judging from an angling experience of ten years in several of its branches, and from statements I have heard from intelligent persons, that there has been a falling off at least of a fourth—within the time mentioned. It is true that any legal prohibition of catching salmon within certain stated periods might be often eluded in this country, where a similar law with regard to bringing partridges into market during the breeding season is never, I believe, enforced. Still it appears to be the interest of all classes that some legislative protection should be given to the salmon, and rigidly carried into operation. For instance, a prohibition of catching or selling the fish after the 20th August, (we will say) each year, when they go out of season. A law to this effect, carefully enforced, would, to a certain extent, prevent unhealthy food from being imposed on the public, and tend to keep up an adequate supply of breeding fish. Indeed, if matters go on as at present, salmon, which are even now sold at a high rate in the Quebec market, will, in all probability, before many years pass, become so scarce and dear as to be quite beyond the reach of the community. With increasing means of destruction directed against them on the one hand, and no legal protection when breeding on the other, they will soon be banished from the St. Lawrence, as they have been already from the Hudson, the Avon, the Severn, the Trent and the Thames.

ARTICLE XXIII.—DETACHED THOUGHTS UPON THE HISTORY OF CIVILIZATION BY ANDREW STUART, ADVOCATE.

[Read 15th April, 1837.]

The inductive philosophy of Bacon which has already so much advanced physical science, and is daily adding to its stores, has hitherto been very sparingly applied to that branch of moral science which relates to the civil condition of man and to the laws which regulate the advancement of the species in wisdom, and promote the well-being of nations.

Such laws must exist. Shall blind chance, of which no vestiges exist in the physical world, reign with unlimited sway over the moral fortunes of our race? As there are permanent laws regulating the birth and growth of the individual, so is there not reason to believe that there are laws equally invariable touching the infaucy and growth of the species? One striking difference exists; the individual dies and with him all the knowledge which he has attained—generation disappears after generation, but the species lives enriched by the intellectual wealth obtained by the labors of all these who have gone before. In the hands of its fragile depositaries knowledge is immortal, incorruptible, and endowed with a living spirit which continually augmenteth itseif. Who then would not join in the exclama-
" tion of Lord Bacon—Quod si navis inventum res existimata
" tam nobilis et admirabilis fuerit, quœ opes mercesque hinc
" inde transportat regiones locis disjunctissimas, participatione
" fructuum et commodorum consociat quanto rectius literæ ce-
" lebrari debent que tanquam naves sulcantes Occanum tem-
" poris remotissima secula ingeniorum et inventorum commer-
" cio et societate copulant."

Many modern philosophers of high name, forgetting that laws of this nature can only be detected by a careful study of facts, have expatiated over periods anterior to historical records, and have indulged their imaginations in describing what they are pleased to call the state of nature.* These visions subsist not with historical day light, but like those of a vulgar and childish superstition abruptly disappear with the first grey dawn of morning.

* See some sound philosophical observations upon these theories in Ferguson's Essay on Civil Society.

Less visonary but altogether unsatisfactory is the statement that the natural road to civilization is from the hunter's state to the pastoral—from the pastoral to the agricultural, and again from this last to the commercial state. The induction upon which this theory rests is exceedingly narrow, and does not embrace all the phenomena, nor satisfactorily explain those which it does embrace. Any civilized man examining whence he derives his own civilization will soon perceive that he does not owe it to himself—that he is principally indebted for it to his parents and teachers, and to the generation by which he is environed. But this does not solve the problem, it only removes the difficulty one step back:—how did the last generation obtain their civilization? A like answer is the obvious one to this inquiry, and so backwards as to each successive generation until we reach the creation. We found the savages of North America in the hunter's state, and our own unavailing efforts to confer upon them what we call civilization, sufficiently shews the fixedness amongst them of that condition. The earliest records, and a continued chain of historical testimony down to our own day, exhibit the sons of Ishmael as shepherds, and there appears now as little reason to expect that the Arabians of the desert and many other of the wandering tribes of the East will become cultivators of the earth, as that the red men of this continent will devote their lives to tending upon sheep, and rearing horned cattle. But in truth, these three states are hardly ever found in a simple and unmixed form. The Indian depending as he does, principally upon the chase, cultivates also maize and tobacco, and effects his exchanges through the medium of his rude *wampum* currency; the pastoral man of the East cannot live without some culture of the earth, and some means of transporting, conveying and exchanging commodities, and it is hardly possible to conceive an agricultural state without commerce. At all events the inquiry still remains as to the causes which have led to these and other changes, and which have influenced the progress of civilization in different ages, and in different countries.

It is not difficult to comprehend any given form, or succession of forms, of social existence in people and nations. The great difficulty lies, in ascertaining the causes of the transition from the one form to the other form. Supposing civilization not to have originally existed in the progenitors of mankind, or if it did exist, supposing it to have been lost, how could it in the one case be attained, or in the other regained? How shall the stream rise to a point of elevation above its source? Will it not rather descend, or assume the form of one flat dead level?

Looking at the social condition of man over the habitable globe with reference to civilization, we find the species divided into three great classes; the civilized man of the East,—the civilized man of the West and his descendants of the new World,—and nations, which we denominate savage, scattered in no inconsiderable numbers over the four quarters of the globe.

The civilization of the East, now, and for ages past, has been stationary. The condition of savage nations seems to have the same stationary character, and there does not appear to be within this form of society, any germ from which civilization can be evolved.

On the other hand the European nations exhibit the presence of a vital principle, which for ages has been, and still is expanding, into new and enlarged forms, continually changing and improving their social condition.

In the History of the World one people connects the fixed forms of the civilization, which we still see in the East, with the varying and continually improving manners and institutions of the nations of modern Europe. That people was the Roman people. Touching at one extremity the hierocratic governments of the remotest antiquity—uniting in one stream the separate and various currents of civilization of ancient Italy—incorporating and fashioning the savage inhabitants of countries subdued by her arms and humanized by her policy—Rome when she at last yielded to her barbarian invaders, transferred to her rude conquerors the useful arts and those principles of order and government which were destined gradually to bring out the forms of society which we now see around us.

The extension of her empire had facilitated the diffusion of Christianity, the doctrines and practices of which originated that great and salutary change in human society of which it is not given to us to know the whole future extent.

In contemplating the history of this wonderful people, the inquiry forces itself upon the minds of the most incurious. How is it that the Roman people came to acquire and to retain for so long a period of time, dominion over so many nations? The solution of this problem, when made, will throw much light upon the history of civilization. The materials for legitimate induction, to be found in the History of Rome, are abundant. The history commences with the twilight of civillzation, and its records are preserved in an unbroken chain for twenty centuries.* This problem has been treated by the President, Montesquieu, in his "Considérations sur la Grandeur et le deca-

* Counting from the foundation of Rome to the end of the Eastern Empire.

dence des Romains." Has this important chapter in the history of civilization been supplied by that work? I think not—and proceed to examine its leading positions.

I would premise, that in examining the work of Montesquieu, much difficulty is felt from its want of plan and method, and from the concise and abrupt style of the author. The intermediate links to connect his propositions with the main subject, are omitted, and left to be supplied by the sagacity of the reader, whose modesty or vanity is thus made tributary to the dogmatism of the writer. It becomes necessary, therefore, not to examine and verify inductions, the steps of which are given, but to examine all the possible bearings of his propositions upon the problem under inquiry, and to shew that they do not lead to its solution. This peculiarity of Montesquieu, to which he is probably in no small degree indebted for his reputation, renders necessary the method of exhaustion, and it is hoped will serve as an apology for the tediousness which too often accompanies that method, and which it may not be here possible to avoid.

I would further premise that there are two conditions which any solution of this problem, to be satisfactory, must fulfill. 1stly. The causes assigned must be not only of a nature to augment the political power of a state, but must also have been peculiar to the Roman State—and 2ndly. It ought to be shown whence these peculiarities originated.

The first and principal cause of the greatness of Rome, assigned by Montesquieu, is the usage of triumphs.

"Romulus (says he) and his successors were in almost per-
"petual wars with their neighbors, to increase the number of
"their citizens, their women, and their territories. They used
"to return to the city laden with the spoils of conquered na-
"tions, and these spoils, which consisted of wheat sheaves and
"flocks, used to fill them with the greatest joy. Such is the
"origin of triumphs to which that city afterwards chiefly owed
"its grandeur." But if we examine the previous history both of the East and West, we shall find that this was not the origin of triumphs, but merely the first occasion of their use at Rome. We shall find that they existed long before the foundation of Rome,—that they naturally spring up wherever war comes to be pursued as a system, and victory to be considered as a national good; and that of course numerous nations practised them who never rose to such power and eminence as the Romans. Triumphs have been most general in the most uncivilized States. The Mexicans followed the practice, not only in its most ostentatious, but in its most cruel and barbarous forms

as the companions of Cortez witnessed in the case of their unfortunate comrades. At the present day, the return of a New. Zealand chief from a successful expedition, is strictly triu mphant

The foliowing is Livy's account of the triumph of Romulus :—

Ne Crustumini quidem atque Antemnates, pro ardore iraque Cæninensium satis se impigre movent: ita per seipsum nomen Cæninum in agrum Romanum impetum facit. Sed effuse vastantibus fit obvius cum exercitu Romulus, levique certamine docet, vanam sine viribus iram esse: exercitum fundit fugatque: fusum persequitur: regem in prœlio obtruncat, & spoliat: duce hostium occiso, urbem primo impetu capit. Inde exercitu victore reducto, ipse cum factis vir magnificus, tum factorum ostentator haud minor, spolia ducis hostium cæsi suspensa, fabricato ad id apte ferculo gerens, in Capitolium ascendit: ibique ea quum ad quercum pastoribus sacram deposuisset, simul cum dono designavit templo Jovis fines, cognomenque addidit Deo: *Jupiter Feretri*, inquit, *hæc tibi victor Romulus rex regia arma fero, templumque iis regionibus, quas modo animo metatus sum, dedico: sedem opimis spoliis: quæ regibus ducibusque hostium cæsis, me auctorem sequentes, posteri ferent.* Hæc templi est origo, quod primum omnium Romæ sacratum est: ita deinde Diis visum, nec irritam conditoris templi vocem esse qua laturos eo spolia posteros nuncupavit: nec multitudine compotum, ejus doni vulgari laudem. Bina postea intra tot annos, tot bella, opima parta sunt spolia: adeo rara ejus fortuna decoris fuit.

Livy, lib. i. c. 10.

From the foregoing quotation, it appears, that there is no authority from Livy for attributing to Romulus the invention of the triumph. He attributes to that founder, the invention of that kind of triumph only, which was accompanied with the presentation of the *spolia opima.* Plutarch, however, in the following passage does attribute the invention to Romulus; but with how little reason, will appear, from the considerations to be afterwards adduced :—

In his life of Romulus, he says—" Romulus, that he might " perform his vow in the most acceptable manner to Jupiter, " and withal make the pomp of it delightful to the citizens, " cut down a tall oak which he saw growing in the camp; " this he adorned like a trophy, and fastened thereon Acron's " whole suit of armour, disposed in its proper form; then he " himself girding his garment about him, and crowning his head " with a laurel garland, his hair gracefully flowing, carried the " trophy erected upon his right shoulder, and so marched on " singing songs of triumph, his whole soldiery in arms following

" after, and the citizens all receiving him with acclamations of " joy and wonder. The pomp of this day was both the original " and model of all succeeding triumphs.

Notwithstanding the assertion of Plutarch, nothing is more clear than that the triumph had its origin in a period long antecedent to Romulus.

In truth, of all the usages which obtained amongst the nations of antiquity, one of the oldest of which we have evidence, is the triumph.

According to the notions of the Pagan nations, the Gods were continually present, conferring temporal benefits or inflicting temporal evils upon individuals and nations. The victories which they achieved which secured to them, not only their goods and lands, but often their own personal liberty and the honor of their wives and daughters, the temples of their Gods and the sacred tombs of their ancestors were conceived to be immediately due to the tutelary Deities of the State.

Any omission to discharge the debt of gratitude thus incurred, it was understood would be followed by immediate and exemplary punishment proceeding from the justly offended Deities.

At the first dawn of history, in the mists of Mythology, we see this institution.

The Indian Bacchus, son of Semele and Jupiter, had a triumph in honor of his Indian victories seated on a car drawn by tigers.

> Qualis odoratis descendens Liber ab Indis
> Egit pampineos frænata tigride currus.
> Sil Ital. lib. 17.

This Bacchus may be considered the same as Osiris (Diod. Sic. lib. I.). They were worshipped with the same ceremonies, and were probably both considered as incarnations of the Sun. We are thus carried back to the most remote period in Egyptian story.

That the triumph of Bacchus was the original of the Roman triumph, is proved by many circumstances.

It was from one of the names of Bacchus (Thriambos) that the ceremony derived its appellation (Varro de Ling. Lat. See also Plutarc in Marcello and Diod Sic.)

The Io triumphe mentioned in the Roman Poets, was an invocation to Bacchus, by this name. Examples are frequent.

> Tuque dum procedes, *Io Triumphe,*
> Non semel dicemus, *Io Triumphe,*
> Civitas omnes dabimusque Diis
> Tura beniguis
> Harat, lib. iv. carm.

Io Triumphe, tu moraris aureos
Currus & intactas boves
Io Triumphe nec Iugurthino parum
Bello reportastis ducem.
Horat. Epod. ii. ode ix.

And Tibullus says :—

Ipse gerens laureas, laurodevinctus agresti
Miles Io maguâ voce Triumphe canit.
Lib. ii. Eleg. vi.

Ovid, speaking of the triumph of Germanicus—

Tempora Phæbelauro cingitur Ioque
Miles Io maguâ voce Triumphe canet.
Lib. iv. Eleg. ii.

See also Ovid, lib. i. amor—Eleg. ii.—

Martial, lib. vii. Epigram.
Et Alcimus Avitus, lib. vi. ad Fusinam sororem c. vi.*

Triumphs were in use with the Hebrews.
Exodus, chap. xv. 1 Sam. xviii.

With the Persians.
Cedrenus, p. 114. Athen, lib. v. Herod, l. 7.

With the Carthaginians.
Polyb. lib. 3.

Virgil alludes to these last in the following lines :—

Quos Africa terra triumphis
Dives alit.
Aen. iv. 37.

and to a like usage amongst the ancient Arcadian inhabitants of the Palatine Mount, in the exquisitely pathetic lament of Evander, on the dead body of his son Pallas—

Hi nostri reditus expectatique triumphi
Hæc mea magua fides at non Evandri pudendis
Vulueribus passim aspicies : nec sospiti duæ
Optabisnato funus pater.
Aen. lib. xi. 54.

The triumphs of Sesostris are still exhibited on the walls of the temple of Memphis, on which the victor himself is distinguishable with features strikingly resembling the great Captain, who, in our day expiated his faults, and terminated his misfortnnes at St. Helena.

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* See these and other passages in Brisson, Ant. Form. Rom. p. 394.

As the followers of Romulus from Longa Alba, derived their religion and usages from the Greeks, it is necessary to ascertain whether traces of this usage are to be found amongst the latter.*

An offering to the Gods out of the spoils taken from the enemy, sometimes by collecting them in a heap and consuming them with fire—sometimes by dedicating a certain portion of them, or making presents out of them to the Gods, was common amongst the ancient Greeks, and many traces of this usage are found in their Poets. Trophies consisting of the enemy's armour, hung upon the trunk of an olive tree as the emblem of peace—of the oak as consecrated to Jupiter—or of the favorite tree of another God—were not unfrequent. This custom was very ancient, (Herod, xi) and universally received, not in Greece alone but in most other countries—hence Hector promises to dedicate his enemy's armour in Apollo's temple, if he would vouchsafe him victory:

> If kinder Phœbus my proceedings bless
> And crown my bold attempt with good success,
> Make Hector conquer, whilst his foe shall bleed,
> And give me the honor of so brave a deed,
> When I've despoil'd my foe his arms I'll bring
> And there devote them in his temple ———

As a further expression of their gratitude to the Gods, it was customary to offer solemn sacrifices, and return public thanks.

Sometimes they erected towers which they adorned with the spoils of their enemies, as was done by Fabius Maximus and Domitius Ahenobarbus after the victory over the Allobroges—at other times they raised lofty altars to the Gods, whereof we have an instance in Alexander after his return from his Indian Expedition. And at others the God was honored with a temple, as was done by the Dorians after their victory over the Acheans, and by Romulus upon the occasion of this victory over the Cæninenses.

The trophy erected by Æneas on the occasion of his killing Mezentius is the same as that of Romulus.

> Vota Deum primo victor solvebat Eoo;
> Ingentem quercum, decisis undique ramis,
> Constituit tumulo, fulgentiaque induit arma,
> Mezenti ducis exuvias, tibi, magne, tropæum,
> Bellipotens; aptat rorantes sanguine cristas,
> Telaque trunca viri, et bis sex thoraca petitum
> Perfossumque locis, clypeumque ex ære sinistræ
> Subligat, atque ensem collo suspendit eburnum.

* See Potter's Antiq. II. 14.

The vow by Romulus of a temple to Jupiter Feretrius corresponds with the above mentioned erection of a temple by the Dorians in honor of their victory over the Acheans. The last was dedicated to Jupiter Tropaios, and the epithet Feretrius has the same import as Tropaios Pheretrum signifying the trunk upon which the arms were suspended.

The whole ceremony of the Triumph of Romulus, it thus appears, is of Greek origin. That which next followed it of Tarquinius Priscus is Etruscan.

The principal part of the forms of the last were continued to the end of the Republic.

The facts transmitted to us by the Historians and Poets of Rome, afford us a deeper insight into this usage as practised during the Republic, than we can have as to more ancient nations.

The Roman Triumph from the time of the expulsion of the Kings, was a thanksgiving to the Gods, and an expiation authorized by the Senate at the instance of a successful General, being a Dictator Consul, or Prætor, and his army, and sanctioned by a law of the people, permitting the General, followed by the army, to enter the city in triumphal order. It was the form in which the Roman people rendered to the Gods the ancient and accustomed homage for some signal victory obtained by the army under the auspices of the triumphing general, over the enemies of Rome, in a regular war, whereby the territory of the state had been enlarged.

That the Triumph was primarily a thanksgiving to the Gods, appears from the form in which it was asked for and decreed by the Senate.

The successful general proclaimed Imperator on the field of battle by his soldiers, sent to the Senate letters fastened with laurel, containing an account of his victory, and of the loss on both sides. The fasces of his lictors and the arms of his soldiers were also adorned with laurels. The oaths of his centurions taken before the Questors, attested the truth of his letters and established that more than five thousand, according to one author, or six thousand according to another, of the enemies of Rome had fallen. A salutary jealousy of the military power, prohibited the victorious general and his army from coming within less than five miles from the walls of Rome—the nearest limit of the *Ager Romanus*—unless sanctioned by a law of the people. The Senate met without the walls in its consecrated Curia, to hear and determine upon his prayer,

UT OB REM BENE GESTAM DIIS IMMORTALIBUS HONOREM HABERI JUBERENT ET UT SIBI TRIUMPHANTI URBEM INGREDI VICTOREMQUE EXERCITUM DEPORTARE LICERET.—(Brisson. de Form. Rom. p. 231, and the Authors by him cited.)

The religious character of the Triumph is expressly confirmed by the following passage in Livy.—Lib. xxxiii.

In senatu, cùm more omnium Imperatorum, expositis rebus ab se gestis, postulassent, "UT PRO REPUB. FORTITER FIDELITERQUE AD-"MINISTRATA, ET DIIS IMMORTALIBUS HABERETUR HONOS, ET IPSIS TRIUMPHAN-"TIBUS URBEM INIRE LICERET:" Se verò "EA QUÆ POSTULARENT DECER-"NERE" Patres "MERITO DEORUM PRIMUM DEIN SECUNDUM DEOS CONSU-"LVM RESPONDERUNT."

This decree of the Patrician order—for a long time the sole possessors of ecclesiastical and administrative powers—and of the knowledge of the *majora auspicia* upon which the fortunes of Rome depended, authorized the introduction and passing of a law by the Roman people, granting to the Imperator power to enter the city in triumph—with his army, and superseding for the day of the triumph, every Magistracy from the Consul downwards.

Thus far the institution bears all the marks of being at once a religious and civil one—and it will be found to retain them in its progress and conclusion.

On the day assigned for the triumph, the army was assembled by its Chief, not in his military dress and accoutrements, but with a star bespangled purple toga, his face vermillion, like the Capitoline Jupiter,* and like him wearing a purple *tunica palmata*, in one hand an ivory sceptre with the perched Eagle, in the other a branch of laurel, himself crowned with laurel, with a plain iron ring on his finger, emblem of frugality; he addressed them from his tribunal in praise of their exploits, and distributed amongst them the various military distinctions and rewards to which he thought them entitled, and their share in the spoils. This preliminary ceremony having ended in a sacrifice, he ascended not a war chariot but the turret formed car, peculiarly appropriated to this purpose, accompanied by the youths of his family, and drawn by four white horses, the horses of Jupiter *Dios Hippoi*, as they are called in Herodian (lib. 7.) praying thus—DII, NUTU ET IMPERIO, QUORUM NATA ET AUCTA EST RES ROMANA, EANDEM PLACATI, PROPITIATIQUE SERVATE.

A public slave, according to others, the public executioner, held over the head of the triumphing general, a crown of gold, too weighty for him to wear, reminding him from time to time, that he was only a man. Tied to the bottom of the car, was a scourge and the *tintinabulum* worn by criminals going to execution, to bring to mind the sovereignty of the laws.

* Camillus was so painted, but the usage afterwards became obsolete.

At the head of the procession were trumpeters playing triumphal airs, and the priests and ministers of the temple, in regular bodies, driving before them the destined victim, the white ox with his garlands and fillets and gilt horns carrying their sacred implements of sacrifice with frankincense, wine and meal; these were followed by the more splendid of the spoils, piled up in vehicles or carried by youths dressed for the occasion. Then came the names and titles of the conquered nations, with models of the captured cities, and sometimes with strange animals or plants from the conquered country—next the captured chiefs of the enemy in chains—the golden crowns presented by Roman provincials in honor of the triumphing general, and after them the triumphing general himself with regal and divine insignia on his lofty car of ivory inlaid with gold.

He was followed by his army and a crowd of citizens and strangers carrying laurel branches and singing triumphal songs.

The Senate received and joined the procession at the *porta triumphalis*. The whole proceeded through the city, all the temples being open and filled with perfumes, and through the *via sacra* to the hill of the capitol—on turning towards which from the forum, the captives were ordered to be taken to the Tullian Prison, where they were either confined for life or strangled. On reaching the capitol the triumphing general pronounced the following prayer:

GRATIAS TIBI JUPITER OPTUME MAXUME TIBIQUE JUNONI REGINÆ, ET CÆTERIS HUIUS CUSTODIBUS, HABITATORIBUSQUE ARCIS DII, LUBENS LÆTUSQUE AGO, RE ROMANA IN HANC DIEM ET HORAM PER MANUS QUOD VOLUISTIS MEAS SERVATA BENE GESTAQUE EANDAM ET SERVATE, UT FACITAS FOUETE PROTEGITE, PROPITIATI, SUPPLEX ORO.*

The victims were immolated with the greatest solemnity—the golden crown dedicated to Jove and precious gifts, shields and other memorials hung up in his temple.

The whole concluded with a distribution of monies amongst the people, the depositing of the spoils in the public treasury, and with a religious feast at the public charge.

The error of Montesquieu, respecting the origin and nature of the Roman triumph, is a fundamental one. This usage cannot be rightly understood, without a correct knowledge of the form and structure of society in ancient Rome, and of some of the most important changes which it underwent.

* This and the previous prayer is given upon the authority of Rosini Antiq. Rom. pp. 772. 773, de triumpho majore, in the Prolegomina, to which chapter, by Dempster, will be found all the principal passages in the Roman Poets and Historians which have relation to this usage.

To none of the institutions of Rome is more applicable, the expression which Cicero applies to civil law generally, *Plurima est in omni jure civili antiquitatis effigies.*

At the foundation of Rome the Hellenic descendants from Longa Alba, with the cognate Arcadian inhabitants of the Palatine Mount, formed the whole of the subjects of Romulus. Their coalition with the Sabine tribe, and the transfer of the Cæminenses and other Sabines to Rome, gave a numerical preponderance to that portion of the inhabitants of Rome. In an elective monarchy as that of Rome was, we may infer from the elevation of Numa Pompilius, a Sabine, to the throne, a preponderance of the Sabine population. That preponderance was, however, probably not very considerable, as this king was succeeded by Tullus Hostilius, the grandson of the Hostilius, who distinguished himself under Romulus, in the battle with the Sabines, commanded by Titus Tatius, and therefore of Longa Alban origin, and he again by Ancus Martius, the grandson of the Sabine Numa Pompilius. The next king, Tarquinius Priscus, was of Etruscan birth and education ; and his successor, Servius Tullius, was educated in the family of Tarquin, and raised to the throne by the influence of the Etruscan Queen Tanaquil. The successor of Servius Tullius and the last of the Roman Kings, Tarquinius Superbus, was also of Etruscan origin. The expulsion of this last king from Rome appears to have been the consequence of a general revolutionary spirit throughout all Italy ; for, after his reign, we find no mention made of kings in any of the wars, or negociations of Rome, subsequently recorded.*

The basis of the religious system improved by Romulus, was the religion of the Greeks, as it was practised before the age of

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* The revolution which destroyed the Pythagoreans in all the Greek Cities of Italy, seems to have been a part of a great movement which extended to Rome, and led to the expulsion of Tarquin. It seems to be established, that the birth of Pythagoras did not precede the year 600, A. C., and that his death was posterior to 509, A. C. He was certainly a cotemporary of Servius Tullius, and the last Tarquin. See Dissertation sur Pythagore ou l'on fixe le temps auquel ce Philosophe a vecu par M. de la Nauze. Mem. Ac. Insc. xiv. 375, and Recherches sur le temps auquel le Philosophe Pythagore, fondateur de la Secte Italique, peut avoir vecu par M. Freret. Ib. p. 472. The extent and violence of the revolutions and seditions excited in Magna Grecea, by reason of the Pythagoreans, may be judged of by the fact that the memory of them subsisted in this part of Italy, down to the time of Pozphyry, who was born in the year 332 of the Christian Æra, were still spoken of there, and were called—

Ἐπῖ των Ρυθαγορεων στασείς

If we are to believe, Tertullian Pythagoras aspired to the dignity of king of Thurium. Tertul. Apol. 46.

Hesiod.* The religious institutions of Numa Pompilius were derived from the *vetus ac tetrica disciplina Sabinorum.* We know that the religion of Romulus was exceedingly simple in its character and forms ; there are no traces in the Greek religion of a sacerdotal cast. There is reason to believe that the religion of the Sabines was at least equally simple.† That of the Etruscan differed essentially from both the former. The government of ancient Etruria appears to have been as purely hierocratic as that of ancient Egypt. The administrative and the ecclesiastical powers were exclusively in the sacerdotal cast of the *Lucumones ;* the mass of the people were in a state of the most abject slavery, and employed in works of as stupendous magnitude as those of Egypt, differing from them only in being works of great and durable public utility, instead of being merely ostentatious. The hierocratic system was introduced and established by the Tarquins, supported as these kings doubtless were, by the Etruscan portion of the Roman people. Hence the establishment of the power of the Patricians as a sacerdotal cast apart from the mass of the people. The law of the twelve tables interdicting the intermarriage of the Patricians with the Plebeians was not taken from the original institutions of Rome, but formed a part of the hierocratic system of Etruria, which had been transferred by Tarquin to Rome, and incorporated with the old Greek and Sabine institutions.

These changes are distinctly visible in the forms of the triumph ; that of Romulus was purely Hellenic, and corresponded with the simplicity of the Hellenic religion and manners. The triumph of Tarquinius Priscus bore a deep impress of an hierocratic government.‡ In this government the king and the high priest are the same—

> Rex Anius, rex idem hominum Phœbique Sacerdos.
> Vittis et sacrâ redimitus tempora lauro.
>
> Æneid, 3, 80.

They are both identified as much as possible by the splendor of their attire with the God who is worshipped. Hence the *toga picta*, the *tunica palmata*, the ivory sceptre with the perched eagle, the vermilion painting, the sacred turret formed car, the four white horses of Jove. Hence, too, the ceremony was purely religious, the object of it was not so much to encourage military ardor, as to bring back a high spirited soldiery to habits

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* See the first book of Dion. Hal.

† The Sabines seem to have been Celts. See Pelloutier Histoire des Celtes. The sacerdotal order, with the Celts, was not a cast.

‡ Eutropius, lib. 1, and Florus, lib. 1. c. 5, expressly refer the origin of the Triumph to Tarquinius Priscus. Besides the forms of the triumph, as

of obedience and peaceful submission to the civil authority and to the priesthood who were the depositaries of it. The procession commenced and ended with prayer. The procession was preceded by the priests and the victims; and the spoils and the captives, and the laurel crown with the golden ones which preceded the triumphal car, were parts of the priestly *cortege.* These are obvious accompaniments of a Pagan thanksgiving. In the laurel crown preceding the car, and in the laurel branches held by the triumphing general, and by those who followed him, are to be found the expiatory character of the triumph. While other spoils are hung up in the temple of Jupiter, the laurel crown, as the most valuable of the gifts, was placed in the lap of the God—

> —Nondum gremio Jovis Indica laurus,
> Nondum Arabes, seres que rogant.
> Statius.

It was peculiarly the *corona triumphalis.* See *Festus* Triumphales Coronæ. *Gellius*, lib. 5, c. 6, and *Tertullian.* There is a remarkable passage in Pliny respecting the use of the laurel in religious rites, and particularly in this particular rite of the triumph.

Laurus triumphis proprie dicatur, uel gratissima domibus, janitrix Cæsarum pontificumque : quæ sola & domos exornat, & ante limina excubat. * * * * *

Ipsa pacifera, ut quam prætendi etiam inter armatos hostes quietis sit indicium. Romanis præcipue lætitiæ victoriarumque nuncia additur literis & militum lanceis, pilisque. Fasces imperatorum decorat. Ex his in gremio Jouis optimi maximi deponitur, quoties lætitiam victoria novam attulit. Idque non quia perpetuo viret, nec quia pacifera est, præferenda utique myrto & oleæ est, sed quia spectatissima in monte Parnaso. Ideoque etiam gratta Apollini, assuetis eo dona mittere jam & regibus Romanis, teste L. Bruto. Fortassis etiam in argumentum, quoniam ibi libertatem publicam is meruissit, lauriferam tellurem illam osculatus ex responso : Et quia manu satarum receptarumque in domos, fulmine sola non icitur. Ob has causas equidem crediderim, honorem eis habitum in triumphis potius, quàm quia suffimentum sit cædis hostium &

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practised in the time of the Republic of Etruscan origin, already mentioned, the *aurea bulla,* which hang from the neck of the triumphing general with some amulet in it against envy, is probably also derived from Etruria. The God Fascinus, whose image was suspended to the bottom of the triumphal car, was an Etruscan God. (Plin. Nat. Hist. xxxi. 4. 33.) The Fescenine verses, which were sung by the followers, derived their origin and their name from a city of Etruria. (See upon the subject of these verses, Muratori Dissertat. sopra le Antich. Ital. Tom. II. p. 515.)

purgatio, ut tradit Massurius. Adeoque in profanis usibus pollui laurum & oleam fas non est, ut ne propiciandis quidem numinibus accendi ex his altaria aræue debeant. Laurus quidem manifesto abdicat ignes crepitu, & quadam detestatione, interaneorum etiam vitia & nervorum ligno torquente. Tiberium principem tonante cælo coronari ea solitum ferunt contra fulminum metus. Plin. Nat. Hist. lib. xv. c. 30. See also Juvenal, Sat. 2, v. 158.

The authority of *Massurius Sabinus*, referred to by Pliny, is much higher than his own upon this matter. Sabinus was one of the most distinguished of the Roman jurisconsults, from whom the Sabinian sect derived their name, the author of several works upon law of the highest estimation, as is evinced by his being named in the Theodosian Code, one of the nine jurisconsults to whose responses the authority of law is by that code given,* and his works are commented upon by Ulpiau, Pomponius and Paul. (See the Digest.†) The religious usages, their origin and import, constituted a part of the jurisprudence of Rome, and this union of religion and law, was also one of the consequences of the hierocratic power; hence is derived the Roman definition of jurisprudence. *Jurisprudentia est divinarum atque humanarum rerum notitia, justi atque injusti scientia.* Inst. 1. Massurius Sabinus, therefore, in the passage quoted by Pliny, was writing *de suâ arte*, and is therefore entitled to full credence.

The allusions in the Roman Poets to the laurel, are without number. I have never met with more than one allusion to the form of the letters from a general informing the senate of a defeat. It will be found in Juvenal, Sat. iv. v. 149.

> Tanquam de Cattis aliquid, torvisque Sicambris,
> Dicturus; tanquam diversis partibus orbis,
> Anxia præcipiti venisset epistola penna.

upon which passage an ancient scholiast observes—Antea si quid nuntiabant consules in Urbe per Epistolas nuntiabant, si victoriæ nuntiabantur laurus in epistula figebatur si autem aliquid adversi penna figebatur.

The revolution which seems to have ended in the destruction of all kingly power in ancient Italy, with the expulsion of the last Tarquin, constitutes one of the most important epochs in the history of civilization, and thenceforward the connexion between ancient and modern civilization can be traced.

Down to this period of time the hierocratic governments and

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* Cod. Theodos. L. i. T. iv. de Respons. prud.

† Besides general references in various laws AD SABINUM, his books MEMORABILIUM are mentioned, l. 144, D. de Verb. signific. AD EDICTUM PRÆTORIS in li. 18, de Oper. libert. and ADSESSORIORUM in l. 5, § 8, D. de injur.

the simpler and more free Hellenic, Sabine and Aboriginal governments stood apart. The destruction of the regal government left every where, except at Rome, the remaining elements of each particular government to assume their natural place, upon the withdrawal of the regal power. Rome contained three several systems of religious institutions, and manners, partially amalgamated, on all of which the hierocratic government had a dominant, but not unlimited sway.

The consequences of the expulsion of Tarquin must be sought for as well in the principles of revolution, peculiar to the hierocratic system, as in the manners and habits of the two races not educated in that system.

By the succession of the elder Tarquin, the hierocratic system had been superindnced upon systems more simple and free. Its tendency was to make of the king, a mere pageant, and to distribute the substance of power among the members of the sacerdotal cast, of which he still remained at the head. A man of vigor and talent like the last Tarquin, would naturally be exposed to a conspiracy from the Patricians who formed that cast, and it was by them accordingly that he was expelled; but it formed no part of the plan of those who expelled him, that any substantial power should be given to the mass of the people. The king was to be removed, but the power of the sacerdotal cast was to remain unimpaired. It was necessary to conceal, however, from the people, by whose physical energies the revolution had been achieved, that their condition remained the same. This revolution, therefore, was followed by no abridgment of the power of the Patricians; on the contrary, that power was augmented by all the portion of power which had belonged to the king.

The modifications which the form of the triumph appear to have received at this time, were the result of the two antagonist principles which agitated the Roman Republic, down to the period of its final destruction under Augustus, when that destruction is again marked in a change of the form of the triumph to be hereafter adverted to. These modifications were further represented by the emblematic forms of the day. Upon the extinction of the regal power, the whole of the hierocratic authority came to be vested in the senate. The only power which that authority had to fear in states constituted as these ancient states were, was the military power; hence arose the provision that no general of an army should enter the Roman territory proper, the *ager Romanus*,* without a decree of the

* For the limits of the *ager Romanus*, see Sigon de Antiq. Jur. Pop. Rom. p. 6.

senate authorizing it; hence the practice of the senate meeting the triumphing general at the *porta triumphalis*, and preceding his car; hence the necessity of the decree of the senate authorizing a rogation to the people to grant the triumph; hence the triumphing general was not permitted to use any of the ornaments, or circumstances of his triumph, one instant after the ceremony ended. Marius, in the plenitude of his military power, venturing to go into the senate in his triumphal dress, excited such sentiments of indignation, that he was obliged, abruptly, to leave it, and put on the usual *prætexta*.* And the privilege conferred on Metellus of going to the senate in his car, is one of the extraordinary honors conferred upon that great man, and now stands recorded upon an ancient stone at Rome.† The new forms introduced upon this occasion, with reference to the mass of the people, rather flattered their prejudices than conveyed any substantial power. Amongst these are to be numbered, the scourge, the tintinabulum, the slave, or public executioner, holding the crown over the head of the triumphing general, and reminding him that he was but a man.

The two inferior forms of triumph, the ovation and the triumph upon the Alban Mount, cannot be rightly understood without reference to the Pontifical Law of Rome. The ovation, like the greater triumph, besides being a thanksgiving, or rather a public rejoicing, was also an expiatory rite. Hence the use of the myrtle in the ovation, that tree being as well as the laurel, used in expiatory ceremonies. We learn this fact too from Pliny—

Quippe ita traditur: myrtea verbena Romanos Sabinosque, cum propter raptas virgines dimicare voluissent de positis armis pacificatos in eo loco qui nunc signa Veneris Cluacinæ habet. Cluere enim antiqui pugnare dicebant. Et in ea quoque arbore re suffimenti genus habetur. Ideo tum electa, quoniam conjunctioni & huic arbori præest Venus. Haud scio an primæva etiam omnium in locis publicis Romæ sata sit, fatidico quidem & memorabili augurio. Inter antiquissima namque delubra habetur

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* Plutarch in Mario.

† The following is the inscription:—

L. CÆCILIVS. L. F.
METELLVS.

PONTEFEX. MAX. CONS. II. DICTATOR. MAG. EQ. XV. VIR. AGRIS. DANDIS. QVI. PRIMVS. ELEPHANTOS. PRIMO. PVNICO. BELLO. DVXIT. IN. TRIVMPHO. PRIMA. RIVS. BELLATOR. OPTIMTS. ORATOR. FORTISSIMVS. IMPERATOR. AVSPICIO. SVO. MAXIMAS. RES. GESSIT. MAXIMO. VSVS. HONORE. SVMMA. SAPIENTIA. MAXIMVS SENATOR. PARTAM. EX. ÆQVO. PECVNIAM. MAGNAM. SINGVLIS. LIBERIS. RELIQVIT. CLARISSIMVS. IN. CIVITATE. FVIT. TRIBVTVM. EI. VT. QVOTIES. IN. SENATVM. IRET. CVRRV. VEHERETVR. AD. CVRIAM. QVOD. A. CONDITO. ÆVO. NVLLI. ALII. CONTIGIT.

Quirini, hoc est, ipsius Romuli, in eo sacræ myrti fuere duæ ante ædem ipsam per longum tempus. Altera patricia appellata, altera plebeia. Pliny's Nat. Hist. lib. xv. c. 29.

No magistrate, except a Dictator, Consul or Prætor, had the *majora auspicia*, which were involved in the higher triumph, but were not involved in the ovation, and the ovation might therefore be conferred upon a magistrate or officer of a rank inferior to these.

The ecclesiastical power of the senate did not extend beyond the limits of the *ager Romanus* within which the Alban Mount was not included. There was no necessity, therefore, for a decree of the senate to authorize a rogation to the people, for the grant of a triumph in this portion of the Latin territory.

The wisdom of the senate deferred, but did not prevent the extinction of its anthority by military violence. The fourth form of the Roman triumph was that which was seen in the triumph of Augustus, wherein the senate, instead of preceding, followed the car of the triumphing general. And thus ended in a military despotism, the long struggle commencing with Tarquinius Priscus, and ending with Augustus, between the hierocratic institutions introduced by the former, with the more free and simple institutions of the Hellenic Sabine and Aboriginal nations of Italy. I think, therefore, there can be little doubt that the President, Mostesquieu, has entirely misconceived the nature, character, and effects of the Roman triumph.

But if the triumph had been what Montesquieu represents it, still he would not be advanced a step in his enquiry. The formal triumphs are, by him, confounded with the victories which they celebrated. The triumphs were the consequences, not the causes of the victories. And though it be granted, that the hope of obtaining triumphs, encouraged the exertions which led to future victory; yet, still it had not this effect to any greater extent in Rome, than in other nations. Unless some peculiar efficacy in procuring victories, can be shewn to have been inherent in the Roman triumphs, it will not serve to account for the superiority attained by that people. The same institution should have led to the same result every where.

The limits of a paper like the present, do not admit of commenting on the remaining causes assigned by Montesquieu, for the Roman greatness, otherwise than very generally.

The principal of these causes are—their perpetual wars—the annual change of their chief magistrates—their never concluding a peace except after a victory, and their bending all their thoughts and genius to the ends of war, and the consequent improvement made by them in this art, adoptiug from other

nations whatever was best. Further, he adds, the equal distribution of the lands—the vigor of the Roman Institutions, and the policy of the Senate not suffering those to rise whom they had once depressed—making use of their own allies and immediately extirpating the destroyers, choosing the proper time for assailing other states, and making their enemies suffer inexpressible evils, destroying their enemies and draining their treasures, encouraging factions in the free cities and disregarding the faith of treaties.

The circumstances here adverted to are not so peculiar to Rome as to be entitled to be received as leading to a solution of the problem under investigation.

Were the Æqui and Volsci, were the Hernici and the other cognate Latin Tribes less disposed to war than the Romans? Were the Sabines less stubborn or warlike than they? and what of the Marsi of whom it was said by the Romans themselves, that they had never triumphed without them nor over them?—Are the Etruscans, and above all the Gauls represented to us as indifferent to military glory? The truth is that at this period of the history of the world, war was considered as one of the principal means of acquisition as commerce now is. This notion was incorporated with the manners and feelings and policy of all these nations. In this order of things the meanest citizen felt, that *Omnis civilis vita latet sub tutelâ militaris gloriæ.*

If Rome then was engaged in perpetual wars to increase her wealth and territories, her neighbors were not less moved by the same desires, and if we are to believe the historians of Rome, her victories and conquests were forced upon her by a succession of unjust aggressions.

The frequent changes in the military command of the armies of Rome were the source of much danger, and when her military operations became more extensive, subjected the Republic to great inconveniences and afforded a pretext for the continuance in command of Marius, Sylla, Pompey and Cæsar of the triumvirs, and lastly of Augustus in whom the Republic ended.

Then as to the maxim never to make peace but when victorious; it is quite true that a State in perpetual war pursuing steadily this rule must either vanquish all its neighbors or be itself destroyed. But which shall be the alternative? The Æqui and Volsci were as obstinate as the Romans, but the Æqui and Volsci were exterminated. It is not the rule that gives empire, it is the power that enables them to persist in it. And the enquiry remains, what were the sources of this power?

The improvements made by the Romans in the art of war, were not by any means so great nor their discipline so peculiar

as they are generally represented. The arms and military discipline of the Latin nations seem always to have been the same as those of the Romans. The epoch of the inventionof the legion, is not known, probably it may be fixed about the period of the sacking of Rome by the Gauls. The legion was used by Hannibal and by Milthridates, and it is expressly said by Livy that in the social war, the arms and discipline of the Italic Confederates, were the same as those of the Romans. We have it from the best authority, that so late as the Samnite war which commenced in the year A. C. 343, and continued for sixty-three years the military art was in a less perfect state with the Romans than with the Samnites—Majores nostri (says Cæsar, ap. Sallust.)—arma atque tela militaria a Samnitibus sumpserunt; et quod ubique apud socios et hostes idoneum videbatur cum summo studio domi exequebantur.

This mode of advancement by adopting the improvements of neighboring States, whether friends or enemies, appears to be so very natural that one can hardly be persuaded that it would not be adopted by other nations besides the Romans. And stronger evidence than has yet been offered, would be necessary to induce the belief that these other nations would rest satisfied with inferior instruments of offence and defence, when they saw such superior ones in the hands of their enemies.

But not only were the other Italic States equally warlike, patriotic and greedy of booty as the Romans, but they had like annual chief magistrates, senates and assemblies of the people.

The division of senate and people, of patricians and plebeins, the union of civil and military authority in the same hands—the love of country—the passion for glory—the religious creed, and the destroying of conquered cities, and the occupying of them with colonies—these seem to have been common to all the ancient Italic States, and afford therefore, no solution to the problem, why Rome surpassed the others. The rule not to ransom their soldiers who were made prisoners, was established only after the superiority of Rome over her neighbors, was fully settled.—(Denina, Riv. d'Ital. lib. II. c. 1.)

The Senate managed the resources of the Republic and its foreign relations with all the systematic skill and policy pointed out by Montesquieu in his 6th and 7th Chapters.

Yet the success of these means indicates greater force of moral principle than the Author seems willing to allow to that body. Skill and policy when separated from moral principle degenerate into fraud and violence, and in fact are nothing else. But such ingredients one may be assured could never be the foundation of stable power. To maintain a lengthened sway

over any great portion of mankind, skill and policy must be united to justice. At least they must be believed to posses that union; and unless in the majority of instances they do possess it, the belief of it will not last long. Fraud and violence are readily and sometimes greadily resorted to by the individual. But the rest of mandkind detest them, and are up in arms against them. No combination of circumstances can secure power in their hands. Justice was in fact a distinguished attribute of the Roman Senate, and in numberless instances tempered the precipitancy and ferocity of the people. This was always the case in the better days of the Republic.

Still it is an enigma which has not been solved, how the powers of this body and those of the people could be made to act harmoniously together.—(Hume's Essays, I. p. 387—Essay X. of some remarkable Customs.)

And thus we are still left in the dark as to the means by which Rome rendered herself the mistress of the resources of the whole of Italy, divided as that country was at the time of the foundation of Rome, into so many independent, powerful and hostile states. Montesquieu, in his fourth Chapter, treats of the contest between Carthage and Rome, and assigns reasons for the subjugation of the former power by the latter. Without entering into the consideration of these reasons, or of those which in his fifth Chapter he assigns for the conquest of Greece, of Macedonia and of Syria, after the depression of Carthage, it is quite clear that unless Rome had been mistress of Italy, she could not have conquered those countries. And the question comes back again upon us, how came a horde of Shepherds and Banditti, from most inauspicious beginnings, to obtain the dominion of Italy.

Since the subversion of the Roman Empire, every Italian patriot has sighed over her divisions, and has poured forth unavailing vows for the union of her various states into one independent nation What they have only prayed for, ancient Rome achieved.*

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* Let the concluding sentences of " the Prince" of Machiavelli urging Lorenzo de Medici, to organize and put himself at the head of a great Italian Confederacy to expel foreigners, be read. " Non si deve (says this much abused patriot) adunque lasciar passare questa occasione, acciocchè l' Italia vegga dopo tanto tempo apparire un suo rendentore. Nè posso esprimere con quale amore ei fussi ricevuto in tutte quelle provincie che hanno patito per queste illuvioni esterne, con qual sete di vendetta, con che ostinata fede, con che pièta, con che lacrime! Quali porte se gli serrerebbono? Quali popoli gli negherebbono la obbedienza? Quale invidia se gli opporrebbe? Quale Italiano gli negherebbe l'ossequio? Ad ognuno puzza questo barbaro dominio. Pigli adunque la illustre casa vostra questo assunto

But if all that has been stated by Montesquieu had been true, the solution would have removed the difficulty but one link back;—according to an Indian Fable the earth is supported by a Tortoise, but what supports the Tortoise? Granting the superiority of the Roman Institutions and manners over those of their neighbours, and of all the other inhabitants of the earth—how came this people of banditti and exiles, without any special revelation, at once to have reached so high an elevation in wisdom and virtue?

Upon the whole it does not appear to me that the work of Montesquieu satisfactorily explains the great problem, which he attempts to solve, and I am inclined to believe that the result of a careful study of the sources of the power of ancient Rome, would shew that they were to be found more in the arts of peace than in those of war, and that her military institutions were subordinate to her civil polity.

con quello animo e con quelle speranze che si pigliano l'imprese giuste, acciocchè sotto la sua insegna questa patria ne sia nobilitata, e sotto i suoi auspici si verifichi quel detto del Petrarca :—

Virtù contro al furore
Prenderà l'arme, e fia il combatter corto,
Che l' antico valore
Ne gl' Italici cuor non è ancor morto.

AN ORATION,

DELIVERED BEFORE THE LITERARY AND HISTORICAL SOCIETY OF QUEBEC, AT THE ANIVERSARY PRIZE MEETING, MAY 3D, ADJOURNED FROM APRIL 27TH 1827.

GENTLEMEN,

I regret that the duty now devolving upon me, has not fallen upon a younger, abler, and less occupied member, whose habits and leisure might have enabled him do greater justice to the occasion which now calls us together. As it is, I shall do my endeavour to fulfil the duty assigned to me in such a manner as not to be altogether unprofitable; and I hope I shall receive, as I shall need, that indulgence, which may be considered as due to an attempt that is almost new amongst us. I have chosen as the subject of the present Address, the progress of the Fine Arts, and the means by which that progress may be promoted in this country. It is a subject immediately connected with the best interests, of the country—with the education of all its Inhabitants,—their universal improvement,—their industry—their habits, and the ample means of happiness which their situation embraces.

GENTLEMEN,

In all the stages of its improvement in various ages, knowledge has almost invariably been attended by the cultivation of the Fine Arts. If there is any difference in the causes upon which the progress of both is dependent, it is probable, that the former is chiefly brought about by peace and leisure, the latter by abundance of the necessaries and conveniences of life. Intellectual cultivation more particularly requires quietness and repose. The gratification of a taste for the Fine Arts, is accompanied with more expense, and looks to a society considerably advanced in opulence.

Knowledge, as is well known, is recommended by two distinct causes; the immediate pleasure by which it is accompanied, and the immense advantages which it procures to individuals and to society.

A taste for the Fine Arts, in the same manner, is likewise recommended by the pleasure which these Arts afford, and by the advantages which they bring to individuals, and to societies.

First, and primarily, they are recommended by the pleasure which they afford, by the gratification which they yield to the perceptions of taste, to our love of beauty, and to our admiration of grandeur, by the agreeable impressions which we are capable of receiving from grace, novelty, melody and proportion. These pleasures possess a strong similarity to that which we derive from the gratification of curiosity, namely, that which the understanding receives, when something unknown is discovered, something uncertain is ascertained, or some new province of nature is laid open to our conceptions. The most marked difference appears to be, that the desire of knowledge, like the appetites of sense, excites a feeling of uneasiness when no gratification is afforded: while the pleasures of taste and imagination give rise to no pain by their absence.

The most important advantages arising from the cultivation of the Fine Arts, are those which relate to the moral nature of man; to his liberation from debasing passions, and his advancement in the practice of the duties of his station, and in the cultivation of aimiable dispositions, and honorable habits. They consist in the power which these Arts possess to humanize the minds of men, to diffuse among them a taste for innocent and elegant entertainment, and to withdraw their attention from the grosser pleasures of sense, from the gratification of tumultuous passions, from the wrathful and destructive contentions which have been too incident to the race in every period of its history. It is for these reasons, that every wise and good government, and above all, every constitutional government, ought to bestow upon these arts its patronage, support and co-operation.

But though these important advantages form most just and legitimate reasons for the public legislative encouragement of the Arts in question, they are scarcely to be considered as the reasons why any individual cultivates a taste for them. They are to be considered collateral advantages. They are not sought for by the individual who cultivates the arts; for moral culture depends chiefly upon other causes. He pursues and cultivates the arts in question for the pleasure which they bestow. But the moral advantages and happiness to which they lead, do again strikingly remind us how invariably our felicity is promoted by the habits of mind which the beneficent Author of nature prompts us by other methods to follow, while we have no such object in view. These advantages are indirectly obtained by the man of taste, obtained when he does not seek for them, at least when he is in pursuit of other objects, and are thus lavished upon him by the Author of all good, in addition

to all the happiness of which he so bountifully participates through other means.

It was thus decreed, that they who devoted themselves to calm pleasures, should by this very means, and without thinking of it, prepare themselves for higher moral culture, and a greater adaptation to virtuous dispositions. If this effect does not always follow, being thwarted by more wayward principles, and less propitious circumstances; these exceptions form no sound objection to the rule, that the provisions of nature, in this as in all other instances, are wholesome and beneficent.

Among the causes which have led to the cultivation of the Fine Arts, we must not forget to state, for the enumeration would otherwise be incomplete, the splendor and magnificence which they are capable of bestowing upon opulence and power. It was for the purpose of augmenting the show of power that surrounded them, for fixing the attentions and securing the undivided sympathy, and consequently the support of the giddy multitude, that Eastern Despots erected the enormous structures that have braved the storms of numerous centuries; and for the same purpose they erected the graceful columns, and the varied architectural ornaments, which are still so much admired in the ruins of Balbec and Palmyna, and other wrecks of antiquity. The appearance of supreme felicity that was conceived to be the lot of the inmates of these lofty dwellings, or of those who could command them to rise, was one of the refined arts by which the ancient masters of mankind, secured and perpetuated their dominion. However real and undeniable the sympathy which men bestow upon the unfortunate, the readiness which they indulge congratulation with the rich, the powerful and the happy, is far more conspicuous, far more instantaneous in those who bestow their admiration, and far more available to those who have the benefit of it.* Hence the principles of taste which serve so much to polish and improve the race of men, were also employed, and eminently contributed to fix the chains of slavery, and to preserve these chains unresisted and unloosened through many succeeding ages.

The pleasures of taste, however, being the principal and most efficient cause of promoting the Fine Arts, more especially demand our attention. And among the agreeable impressions made upon our senses by external objects, there is one remarkable distinction. Some are pleasing, while the want of them is accompanied with pain; others are also pleasing, whhile their absence is a matter of indifference.

* Theory of Moral Sentiments.

The objects which are necessary to our existence, yield us pleasure by their presence during a certain interval: the want of them beyond another interval, involves us in pain. Food and warmth in certain proportions, yield us satisfaction. The want of them is followed by pain; that pain increases as the privation continues; at last it produces excruciating torment, and ends in the deprivation of life.

But the pleasures of taste are of a different nature. Their absence whether long or short, is accompanied with no painfnl feeling. It is followed by no danger, nor by any inconvenience to our subsistence. They form a pleasurable, but as far as the existence and continuance of our race is concerned, an unnecessary addition of happiness, which the beneficent Author of existence, has superinduced upon our nature. We could have existed without them, and could have continued to perform all the duties of life and of human society, though they had never existed, or never been enjoyed.

How unreasonable must we then deem, the assertion made by some authors, that pleasure consists only in the removal of pain. So far is this from being the case, that one half of our intercourse with external nature, consists of a series of delights which are no way connected with pain, nor require its pre-existence at all to produce them, which fill the mind with satisfaction while they are felt, and retire in their season without leaving the shadow of a sting behind them. They leave only their remembrance, which is delightful.

To afford us these satisfactions nature lavishes all her charms, and displays all her resources. On all sides of us, we meet with beautiful colours, interesting forms, melodious sounds, picturesque scenery, majestic elevations; clouds and skies, and streams, and fields, and flowers, and the "human face divine!" With such accompaniments as these, has the bountiful Author of existence covered the face of nature, and he has endowed all his rational offspring with faculties fitted to taste and enjoy them.

Still further to augment and extend these pleasurable feelings, the skill, penetration and industry of man, have through the same beneficent arrangement, invented and improved the Fine Arts. To scatter among us still more abundantly, the pleasures which are unconnected with any mixture of pain or distress, the arts of painting, of design, sculpture, music and architecture, lend their aid. Probably, horticulture and some others might be added to the catalogue. As the industry of man becomes appropriated to new and particular channels, the

arts, like the sciences, become subdivided, and claim to themselves new designations.

The progress of the Fine Arts, has most commonly kept pace with the advancement of knowledge. But the union has not been invariable. That this should not be the case, may be sufficiently explained from the circumstance, that the progress of the two does not depend on the same causes. That the union should most generally prevail, may arise from two circumstances; first, that the progress of general knowledge serves to diffuse an acquaintance with the means of improving the arts; and secondly, that the same event serves to extend more widely the reputation of the artists themselves, as well as the fame of their productions. The usual coincidence of progress in the Fine Arts, with that of intellectual improvement in general, will be evident from a slight review of the history of both.

When the states of Greece began to breathe after the fierce, and protracted struggle which they had maintained with the colossal power of Persia, a high degree of intellectual improvement ensued, and every department of knowledge which could then be supposed to exist, was cultivated by men of the most splendid genius. The arts now under consideration received similar attention, and underwent a similar polish; and many of the productions of the age of Pericles, have served as models in the same departments to all succeeding ages. When power passsed from Macedon to Rome, and knowledge ceaseing to be confined to Greece and Grecian colonies, took up her abode in Latium; the Fine Arts also passed over into Italy, and took possession of the various provinces of the Roman Empire, but especially of the metropolis. The description of the vestiges which they left behind them in these various stations, has served to fill many a modern volume, and to give interest to many a traveller's Journal.

The state of the Arts among the Saracens, after the rise of their power, appears to be the most remarkable exception to the union which has generally been observed. Though that people were eminently skilled in several of the sciences, and founded many colleges, from which the European Univesities were probably first modelled; few traces are to be found of their progress in the Fine Arts: a circumstance sufficiently deserving to be investigated. When, in consequence of the invention of printing, and other causes, the revival of learning took place in Italy during the 15th and 16th centuries, the same union of intellect and taste took place as in the ancient periods. Painting, sculpture, music and architecture received that hold on

the attention of men of letters, which they still keep, and will no doubt continue to do. When learning and science moved northward into France and England, into the Netherlands and Sweden, in the 17th century, they were followed by the same pleasing companions as before. And so well is this union now established, that, in the present extension of knowledge over a great part of the globe, we could never consider a country enlightened, which should be found destitute of works of art.

However unfavourable to the advance of knowledge, the present circumstances of this country may be, and they are indeed extremely unfavourable to it; we must, notwithstanding, esteem it no slight symptom in favour of at least some taste for knowledge, that painting appears to have struck its roots among us. Already several Artists have, notwithstanding extraordinary disadvantages, and amidst the almost total want of encouragement, made distinguished progress in this elegant department.

What may we not, then, expect when the public shall awake to a sense of the merit of such productions, and shall feel disposed to bestow upon them that admiration to which eminence in so difficult an art is justly entitled? When so much eminence has been attained in so withering a climate; what may we not expect when the climate of public opinion shall have become mild, genial and protective? Two of these Artists are members of this Society; and as such ought reasonably to look for such encouragement as its countenance and aid can bestow.

If we esteem it desirable that the Fine Arts should flourish among us, and I know not what can be urged against entertaining such a desire, it then becomes natural to ask, by what means we can advance their progress;—by what means can we promote them? It was formerly a favorite theory to account for the diversities of talent, and the prevalence of genius at different times, from the influence of climate. If that theory had been well founded, it must have proved fatal to our expectations of eminent genius in this country, as the climate is beyond all question unpropitious. But the theory has, furtunately for us, been found erroneous, and the Arts in question, may flourish in any climate, if other circumstances be favorabie.—The banks of the Neva are probably colder than those of the St. Lawrence; but they have been found not inconsistent with superiority in works of art.

At other times it has been expected, that the patronage of the great, would always be sufficient to elicit genius. In the reign of Lewis XIV., an age remarkable for improvements of almost every kind, it was of course considered a matter

of primary importance to promote the elegant arts. The politicians of that period, therefore, expected to obtain fine paintings, admired statues and exquisite poems, by bestowing upon the authors of such works, pensions and honors. Many great authors, accordingly, and artists arose; but, in the end, the politicians who reasoned thus, were disappointed. "No rivals," says Professor Arthur, "arose to dispute the palm with those "painters and poets who had at first been encouraged to excite "the emulation of others. All the patronage of the noblesse, "the pensions and academies of Louis the Great, and the hopes "of applause from an enlightened people, could raise up no "more Corneilles, Racines and Molieres,—no more Poussins, "Le Sueurs and Lebruns."*

If we take a view of the countries in which the elegant arts that have flourished, and now flourish, we shall find, it is by the patronage of the public, they have done so. Give them that encouragement here, and in time they will flourish here, as they have done elsewhere.

It has long been a subject of loud and clamorous complaint among many, who, perhaps, may not be the very best judges; that this country has hitherto produced nothing; that it has brought into view neither genius nor talent. It would be fair to ask those who reiterate this complaint, what they have done to elicit genius and talent. When either of these admired qualities were discoverable in the shade, have the complainants, as in duty bound, advanced half way to meet them, and to offer them suitable encouragement?

There are particularly two modes of encouragement, which the artist naturally and very justly expects, in return for the great pains and study he has bestowed to qualify himself for giving us pleasure. He looks, in the first place, for our applause, or at least for our approbation of that which has cost him so much time and attention, so much exercise of judgment, and so much discrimination to execute. And, in the second place, he looks for a fair and liberal price for his productions, from those who are able to afford it.

Without either of these two species of encouragement, the elegant arts must, in any country, wither, and at length expire. The enthusiasm of an individual may support that individual in his ardent devotion to an unprofitable, that is, an unlucrative art. But the progress of such an art, and its advancement in any country, depend upon a multitude of practitioners; and it is contrary to all reason, to all experience, and to all philosophy, to

* Arthur's Discourses. Lit. Dis. c. ix.

expect the effectual co-operation of such numbers, without the ordinary incentives to human exertion.

The country which desires to possess the ornaments which the fine arts bestow, must be disposed to honor them, and willing to grant remuneration for them.

The productions of the painter, though apparently less durable than those of the sculptor and the poet, may yet, in favorable circumstances, be preserved through indefinite periods of time.

Many of the paintings on the walls of the houses in the ruins of Pompeii, are said to have their colours as fresh as the day they were laid on. And as it is not probable that the works of art, throughout the civilized world, will be again universally destroyed by the prevalence of barbarians, the artists of the late and present ages, may indulge the anticipation, that their works will be known and admired for centuries to come. And let it not be forgotten, that while they immortalize themselves, they confer a similar honor, though perhaps in a less degree, on their patrons, and on the age, and country in which they live.

Another means of promoting the fine arts in Canada, would be a supply of works of art from the hands of eminent masters, which might afford subjects for imitation to our young artists, stimulate them to suitable exertions, and provide lessons for their guidance in practice.

One other desirable object in this view, would be, the establishment of a gallery of paintings. This has been several times attempted, and it may be seen, by the report of the class of fine arts, presented at the last annual meeting, that an expectation is still entertained of accomplishing this important object.

This brings me to the last means I propose to speak of, for promoting the fine arts in Canada; namely, their connexion with the Literary and Historical Society of Quebec, and the motives for the establishment of literary and scientific associations in general. I shall treat this part of the subject in the widest view that can be taken of it, as contributing to the advancement of knowledge in the country, and the dissemination of a taste for obtaining it. Perhaps no means are more likely to promote a desire for education, than the opportunity which it gives of rising to eminence of contending for superiority in some elegant accomplishment. However small may be the number of those who can expect to rise to such eminence, the possibility of such a felicity, is an advantage of which, naturally, no man would wish to deprive himself.

Associations formed for the promotion of literature, science and art, necessarily originate in the great instruments of human

improvement, the power of speech. Had each individual been limited to his own personal discoveries, every one of us, must long ago have arrived at the *ne plus ultra*, at the very utmost extent of knowledge, which it was possible for him to reach.

It is from the mutual interchange of ideas and discoveries that we can alone hope to keep alive a zeal for improvement, and pursue our inquiries with success.

Societies formed for the purpose of mental improvement, existed from the earliest times. They existed among the Hebrews, as appears from the mention that is made of the sons of the prophets, and their living together in a body. In Greece, it is well known, that each sect of philosophers had its particular place for associating, and for the more public discussions of philosophical questions. The name of one of these places, Academus, or a grove to which persons were accustomed to resort for the purpose of holding this sort of intercourse, has descended to us, and is in familiar use at this very day. Another sect was called the Stoics, from the members of it being accustomed to frequent a certain porch or *stoa*. A third, and more numerous body, was called the Peripatetics, from the circumstance that the founder of it was in the habit of walking backwards and forwards while he delivered his instructions.

But none of these associations possessed so permanent a nature, as those which have been formed in modern times, with fixed laws to govern them, with officers voluntarily elected for the more regular conduct of their deliberations, and many of them under the special patronage of the governments under which they exist. They thus become part of the established institutions of the country in which they are situated, and as far as human things can indulge such expectations, may look for a perpetuity of existence. At all events, they may well expect to subsist till something better can be substituted in their place. And no one can doubt that such substitution can only be some improved condition of the same social form. They must be as permanent as the governments under which they subsist. And even when governments, as sometimes unfortunately happens, are revolutionized, the associations now alluded to, generally rise, like another Phœnix, from their own ashes, and assume some new, or some better form.

These associations, under the names either of academies, or societies, with various additional designations, have, of late years, extended themselves in one shape or other over every part of the civilized world. Some of them, indeed, appear to have existed as far back as the time of Charlemagne. But whatever

they were, and however formed, they could not survive the barbarism and disorders of the ages that followed. Some of them sprung up in Italy, on the revival of learning in the fifteenth and sixteenth centuries. And from that time to the present, they have continued to increase both in numbers and importance.

The most important associations that have existed of this kind, whether we consider the length of time they have continued to flourish, or the great services they have rendered to science and to mankind, are the Royal Society of London, and the Academy of Sciences at Paris. Besides the vast contributions which they have themselves made to human knowledge, they have given rise to numerous societies formed for similar purposes in both countries, and their example has been extensively followed in other parts of the world. There is no country in Europe, except Turkey, where similar associations have not been formed. They exist, though but in small numbers, on the continent of Asia; and North America possesses its share. The enumeration of such bodies, is now an indispensable item in the geographical description of every civilized country.

The British association for the advancement of science, ambulatory in its position, and co-extensive with the limits of the United Kingdom has exemplified a new form of such societies, and given new facilities to the diffusion of scientific discoveries, to the communication and comparison of scientific theories.

It was, therefore, high time that Canada should possess her associations for literary and scientific purposes. A population of eight hundred thousand souls, with a great influx of strangers, and the temporary resideuce of numerous officers in his Majesty's service, with an indefinite or rather boundless extent of unexplored natural productions, surely afforded scope for the formation of one or more associations for literary or philosophical purposes. The existence of civilized society in the country, has been of nearly two centuries and a half's continuance; for so far does the field of historical research extend backward, while the history and character of the Aborigines form an extensive field of investigation.

The colonies of New Holland and Van Dieman's Land, which comparatively speaking, are but of yesterday, and not composed, one would imagine, of the most favorable subjects, have already their various societies for literature and art. How is it that so many persons pretend to assure us, that this country is as yet too young to contain and support institutions of the kind in question? If Canada be still too young, to engage in a literary

course, it may fairly be asked when she will be of age. She is already the mother of a numerous, flourishing and rapidly increasing family. It is time she should look to their intellectual improvement.

But when do those who raise these objections, when do they admit that we shall be fit to have literary establishments among us? Perhaps when we shall have a greater number of literary characters. And when, it may be asked, will that happen, if every one hold himself back as much as possible, and refuse all assistance towards the general improvement, and readily sustain every apology that indolence can lay hold of, or dissipation invent, or a complete immersion in business can supply, for withholding his contributions to the public good? When can our literature flourish, if all these excuses, or any of them, are to be held valid? Then only can the country flourish in arts, in science, and in literary occupations, when every one strives to do his utmost according to his ability, according to the department of learning which he cultivates, and according to the leisure he enjoys.

In considering the means by which knowledge in general, and the fine arts particularly, may be promoted, it would be unpardonable to pass over, on the present occasion, the exertions which this society has made for eliciting the intellectual resources of the country by the number of prizes for performances of eminent merit in the several departments of science and art. You have heard declared, Gentlemen, what has been offered by these exertions during the past year. Though the fruit may yet have been small, it affords a hope that a larger harvest may yet follow on some future occasion.

You have observed, no doubt, that the success of our efforts, has been, in no small degree, owing to the liberality of the Right Honorable Sir Charles Grey. It is to be hoped, that the attention now directed to subject of our prizes, *slender as it may seem*, may produce a salutary effect in time to come; may contribute to that developement of hidden talents, and that advancement of intellectual energies, for the sake of which they have been offered, and will, it is hoped, continue to be offered. Many of the societies of which I have slightly, but generally spoken, have it as one of their objects, and others as their only object, to hold out similar rewards with those which the society offers. And many individnals, highly to their honor, have succeeded, as Sir Charles Grey has endeavoured to do, in conferring signal benefits on science and knowiedge by means of the

rewards that they offered for useful discoveries and inventions, for profound investigations, or elegant performances.

I conclude by expressing my hopes, that the force of this example will not be limited to the occasion before us, but that the remembrance will continue to stimulate our youth to laudable exertions,—that it will lead persons of every age to value more highly the exercises of the mind, and especially that it will eventually lead to more permanent encouragement in favor of mental exertions.

ABSTRACT OF THE METEOROLOGICAL JOURNAL,
KEPT AT CAPE DIAMOND, QUEBEC, IN 1835 AND 1836.

1835.	Temperature.			Winds.			Days on which snow fell.	Days on which Rain fell.	Dry days.	Thunder storms, Lighting, &c.	Aurora Borealis.
	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.					
January,	9.° 95	32.° 5	— 22.°	17	10	4	13	6	18	...	1
February,	5. 04	39	— 30	16	7	5	11	1	16	...	4
March,	19. 00	42	— 16	14	15	2	10	...	21	...	3
April,	32. 43	49	11	13	15	2	7	3	21	..	1
May,	47. 37	74	27	15	12	4	2	13	17	2	1
June,	59. 50	82	38	19	8	3	...	16	14	11	3
July,	63. 77	82	46	22	7	2	...	11	20	7	3
August,	60. 23	88	41	21	8	2	...	11	20	1	4
September,	50. 00	75	32 5	22	7	1	...	13	17	1	6
October,	43. 74	68	24	21	7	3	1	11	20	1	1
November,	24. 15	52	— 14	20	8	2	9	3	18	...	2
December,	5. 48	26	— 25	24	5	2	10	2	19	...	3
	35.° 06	88.°	— 30.°	224	109	32	63	90	221	23	32

1836.	Temperature.			Winds.			Days on which Snow fell.	Days on which Rain fell.	Dry days.	Thunder storms, Lighting, &c.	Aurora Borealis.
	Mean at 9, A. M.	Highest.	Lowest.	Westerly.	Easterly.	Various.					
January,	11.° 48	38.°	— 20.°	15	13	3	10	...	21	...	1
February,	7. 93	39	— 26	19	8	2	8	3	20	...	4
March,	19. 65	44	— 12	18	10	3	11	2	18	...	1
April,	32. 18	56	2	16	7	7	8	3	20	1	3
May,	44. 00	77	26	11	15	5	2	16	15	3	3
June,	61. 37	88	42	12	12	6	...	7	23	5	3
July,	65. 94	92	49	18	8	5	...	13	18	8	7
August,	58. 69	79	40	21	5	5	...	13	18	6	11
September,	49. 05	77	26	17	5	8	2	12	16	2	6
October,	32. 47	52	10	22	7	2	9	10	14	...	2
November,	27. 35	49	10	20	9	1	10	4	17	...	2
December,	10. 79	44	— 26	20	10	1	14	5	16	...	0
	34.° 83	92.°	—26.°	209	109	48	74	88	216	25	43

Mr. Watt has lately published a mean of all his observations at Cape Diamond, from 1829 to 1836. The observations were made six times a day, at 6 and 9, A. M., noon, 3, 6, and 9, P. M. The annual mean temperature derived from all these observations (on correcting a clerical error which had some effect on the published results) is $37°\frac{1}{3}$. This is somewhat higher than the mean at 9, A. M. of the same years, which is 36° 51. But the annual temperature obtained by Mr. Watt in this way, does not exceed that contained in those tables, more than might be expected, if it was ascertained that 9, A. M., represented the mean of the day correctly. Since observations at midnight, and 3, A. M., which are wanting for the completion of the daily mean, would tend to lower the result of the whole in some degree.

The mean annual temperature hitherto assigned to Quebec (41° or 42°) is probably too high by four or five degrees. It seems to have been obtained from observations made in the town, where a situation, free from a variety of disturbing influences, would be difficult to find. A review of the annual means published in this volume, would appear to shew a gradual increase of temperature from 1825 to 1829 ; a very slight fluctuation between this and 1831 ; and then a gradual diminution for the last five years.

W. Kelly.

Quebec, November, 1837.

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ERRATA.

Page 79, *line* 8, from the bottom, for "*is to the side P. N.*" read "is equal to the side P. N."

Page 371, for "*Hi nostri reditus expectatique triumphi*
Hæc mea magna fides at non Evandri pudendis
Vulneribus passim aspicies nec: sospiti dum
Optabisnato funus pater.."

Read "Hi nostri reditus, exspectatque triumphi?
Hæc mea magna fides? At non, Euandre, pudendis
Vulneribus pulsum adspicies: nec sospite dirum
Optabis nato funus pater."
Æn. lib. xi. 54.